Exploring the Impact of a Project 2000 Common Foundation Programme Curriculum Upon the Critical Thinking Abilities of a Group of Student Nurses.

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Abstract

Critical thinking is currently a highly valued educational outcome throughout the educational spectrum, but particularly so, in relation to higher and professional education. Nursing education is also embracing the construct critical thinking as a desirable educational outcome, to the extent that, some commentators refer to the importance of critical thinking in nursing as a given.

The purpose of this descriptive-illuminative study was to explore and evaluate achievement regarding the development of critical thinking abilities as a specific curricular outcome, and whether they could be identified in the concurrent professional reasoning processes of student nurses. A longitudinal multi-method approach incorporating across-method triangulation in the collection of quantitative and qualitative data have been utilised in order to address the following questions:

1. Does the current institutional Common Foundation Programme facilitate the development of critical thinking ability in student nurses?

2. Can critical thinking be identified in student nurses' concurrent professional reasoning processes?

3. Does student nurses' reasoning change in complexity over the course of the Common Foundation Programme?

The majority of previous studies relating to critical thinking in nursing have predominantly utilised psychometric testing instruments in pre and post test or correlational designs. The body of evidence emanating from such designs is currently inconclusive. The main challenge in this study was the development of an alternative method of identifying the existence or degree of critical thinking present in the concurrent verbal reports of student nurses' reasoning.

Data collection from a group of student nurses involved the combination of the Watson-Glaser Critical Thinking Appraisal (1991) test (n=43) and a researcher developed think aloud technique incorporating a videotaped client simulation, a cognitive task and stimulated recall strategy (n=12). Findings indicate no significant differences in pre (51.3, SD 7.7) and post programme (51.6, SD 7.3) Watson-Glaser mean scores. With regard to the think aloud technique evidence of critical thinking abilities, the sample consistently displayed evidence of reasoning that was reflective of an absolutist epistemology. In instances where more complex reasoning was demonstrated there was evidence to suggest that metacognitive strategies may contribute to this. The findings raise interesting challenges to future curriculum development, nursing education and nursing practice.

CONTENTS

Contents (continued)

Contents (continued)

LIST OF TABLES AND FIGURES.

LIST OF TABLES AND FIGURES (continued).

LIST OF TABLES AND FIGURES (continued).

LIST OF TABLES AND FIGURES (continued).

LIST OF TABLES AND FIGURES (continued).

LIST OF TABLES AND FIGURES (continued).

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CHAPTER ONE

Outline of Problem Issue

1.1 Background to Study

Prior to the changes brought about by the educational initiative of the United Kingdom Central Council for Nursing, Midwifery and Health Visiting known as: Project 2000: A New Preparation for Practice (UKCC, 1986), nursing education in the UK followed an apprenticeship model. Recruits were employed by health authorities as student nurses and received their professional education from the authority's designated school of nursing. Short blocks of theoretical instruction were followed by longer day and night duty clinical allocations in various speciality environments, concluding with another short 'consolidation' block and so on throughout training. Registration was conferred upon successful completion of a tick box schedule of clinical practice statements, four practical assessments, a series of intermediate written examinations and a final written examination. The philosophical underpinnings of nursing curricula of this era, reflected heavy reliance on a training paradigm, the medical model approach to health care, technical or procedural mastery and task orientation. The employment status of the student nurse also meant that a significant service contribution was commensurate with the role. The application of theory and new learning took place against a background of needing to 'get through the work' and the delegation of responsibilities often beyond the learners level of knowledge and experience. The consequences of this situation often meant that learning could be haphazard, incidental, non-holistic, devoid of feedback and without continuity.

Concerns regarding nurse education had been the focus of ongoing debate since the Athlone report (1938). The issues central to the debate were those of educational standards (Dodd, 1973; Briggs, 1972; Judge, 1985; French, 1989), service delivery

and skill mix, recruitment and retention of students, changes within the National Health Service and the perceived health needs of future populations (Jowett, et al. 1994). The UKCC (1986) initiative and subsequent consultations culminated in the innovative prototype programmes of nurse education launched in 13 demonstration districts in 1989 / 1990. Although the period of education remains much the same (3yrs) a variety of significant changes were heralded in with the new programmes, (see table 1.1.1).

Table 1.1.1 Significant Changes Related to Project 2000 Initiative

Widening of the entry gate into nurse education;
Discontinuation of Enrolled Nurse education
Supernumerary status for student nurses;
The introduction of bursaries for student nurses;
The introduction of a new support worker to assist in care delivery;
The introduction of an 18 month generic Common Foundation Programme;
Specialisation into one of four Branch Programmes for final 18 months;
The broadening of the nursing curriculum;
Changing the Nursing perspective of care towards one of health and Holism;
Increased links with institutions of Higher Education;
Diploma level qualification;
Move towards the adoption of an educational paradigm.

The combination and implementation of these changes were purported to achieve several notable changes in the new practitioner beyond that of a skilled mastery of tasks embedded in a curative perspective of caring. Phrases such as 'holistic practitioner' ' knowledgeable doer ' 'research based practice', 'challenging', 'critically analytical', 'autonomous', 'accountable' and more recently 'reflective' all pointed to desired changes in the new practitioner's thinking abilities.

The original UKCC document (1986) makes both explicit and implicit references to the type of thinking skills desirable to the envisaged 'knowledgeable doer'. For example, p.20 refers to the need for " creativity, thinking ability, problem solving in clinical situations...", p.33 expresses the need for a "...mature and confident practitioner, willing to think analytically and flexibly, able to recognise the need for further preparation...", p.46 suggests that theory should be "... applied critically by the students in different practice settings." Finally, p.40 stipulates:

> " A registered practitioner in other words must be able to carry out care and make the decisions, taking all relevant circumstances into into account, whether that care can be assigned to others. That decision cannot be taken on the basis of the nature of the task alone, but must be seen in the context of the total circumstances of the individual patient or client."

Implicit in this view is the application of the higher order cognitive skills understood to be those of criticality or evaluation. Critical thinking in particular is cited frequently by educational proponents explicating the proposition that Project 2000 courses will or should develop these cognitive skills (Crotty, 1993; Girst, 1993; French, 1992; Robinson, 1991; Jowett et al., 1994). The host institution's (formerly Sister Dora College of Nursing & Midwifery) Registered Nurse / Diploma in Higher Education curriculum, based on project 2000 principles, also cites critical thinking as an educational outcome in several instances. Moreover, from a broader clinical

perspective, Miller (1992, p.1401) suggests "Critical thinking is an integral part of clinical decision making, a routine part of nurses work." Jenkins (1985) and Malek (1986) also posit that nurses need critical thinking skills in order to be safe, competent and skilful professional practitioners. Tolliver (1988, p.174) claims " For the practising nurse, critical thinking is required daily and is, therefore, an expected behaviour of professional nursing." Pardue (1980) believes nurses are expected to have good critical thinking ability to process data and make decisions.

In some areas of the literature the importance of critical thinking to nursing practice is conceived of as a given, in that, the former cannot be conducted in the absence of the latter (Kramer 1993). On a European level, the recent revised draft European Agreement on the requirements and organisation of nurse education cites one of the four main functions in the role of the registered nurse as the requirement: "To develop nursing practice through critical thinking based on research" (Council of Europe, 1995, p. 5).

There, thus, appears to be a degree of consensus as to the espoused relationship between critical thinking ability and competent nursing practice, albeit many of the above proponents fail to specify why and how critical thinking applies to nursing practice. Concomitant with this consensus, within the United Kingdom, are the assumptions or expectations that the profession's new programmes of professional preparation will produce practitioners equipped with this ability and, thus equipped, will apply it to their practice. There is in prospect increasing demands upon practitioners to demonstrate these abilities in light of a range of issues and their impact on the complexity of nursing practice, the revision of professional roles and perspectives, and associated reasoning processes.

Recent economic reforms in health care and the introduction of resource management initiatives have changed managerial structures in the clinical environment and nurse's traditional managerial roles. The devolution of many

managerial and budgetary responsibilities followed the formation of clinical directorates. The inclusion of business managers within the directorates has resulted in situations where nurses have increasingly found themselves practising in an environment where their practice and resources are determined and managed by individuals whose priorities and frames of reference differ from their own. Creation of an internal market means that nurses now practice in an increasingly complex and competitive environment, dealing with increasingly complex client problems and expectations. Issues of quality assurance and standard setting consistent with the business like approach require that nurses continually evaluate and modify their practice accordingly. In respect of the constant nature and pace of change anticipated in healthcare, nurses wishing to act as the patient's advocate, will need to be empowered to argue their cases skilfully and evaluate the arguments of others (UKCC, 1992). The boundaries of professional practice are also changing in light of the new deal on junior doctors working hours. Nurses, thus, need to carefully rationalise the need to expand their practice into areas of the medical domain and the potential implications for their professional accountability. Nurses have also begun to explore new areas of practice, such as complimentary therapies and health education, assessment and promotion. This will not only require the acquisition and application of new knowledge but also alternative perspectives and careful evaluation of new interventions. The shift from healthcare in hospital settings to care in the community will also demand new approaches to client problems, revision of roles and alternative models of the nurse - client relationship. Faster patient throughput in hospitals and nurse's management of the discharge process will also place greater demands on nurse's communication skills. Alternative means of effectively informing and reassuring patients about their preparation for admission, treatments, recovery and discharge will be required.

In light of the changing roles, areas of practice and client expectations nurses need to carefully prescribe, justify and evaluate their interventions and practice, if they are to

practice in a competent and accountable manner. Furthermore, initiatives to involve nurses in the purchasing, commissioning and contracting process, as well as the prescribing of medicines, will require astute critical thinking abilities in a somewhat alien arena (NHS Management Executive, 1993). The cumulative demands of these issues in the face of the current information and technological explosion upon the intellectual abilities and affective dispositions of practitioners will, thus, be substantial. The cognitive demands arising from these issues raises the important question as to whether the curriculum in question is successful in developing the critical thinking abilities required for future practitioners.

1.2. Current Knowledge and Practice

Current knowledge regarding the intellectual outcomes of Project 2000 type programmes of professional preparation is sparse. This is primarily due to the recency of the implementation strategy and subsequent focus on the very issues of implementation itself (NFER, 1992). It is commonly asserted, however, that Project 2000's educational predecessor was not wholly an educational experience but, rather, one of training. The rationale underpinning these assertions suggested that the associated outcomes of such training were not compatible with the aim of producing a critical thinker, capable of making reasoned decisions in the best interests of the client (French, 1992). Assessment of academic competence centred on the ability to recall and apply content in the context of a medically oriented model of care. Clinical competence assessment reflected the ability to perform psycho-motor skills and complete organisational tasks which did not always reflect the needs of clients. It is generally accepted within the profession that the new courses should embrace an educational paradigm and its associated intellectual outcomes, as opposed to one of training. In order to achieve this the changes highlighted previously have been implemented within individual institutions curricular in accordance with English National Board and Higher Education validation criteria.

Consequently, admission criteria have changed, significantly broadening the entry gate to nurse education. Course content has been altered to encompass knowledge domains thought to develop a holistic appreciation of the individual, health, health deviation, health care provision and management. Assessment of competence is now continuous. Written assignments and assessments of clinical competence are apparently designed to demonstrate the acquisition and critical application of theory and research to practice. The question as to whether it is succeeding or not remains unanswered to date. Evidence suggests, however, that academic development is separated from practice and greater emphasis placed upon the former in many institutions (Ramprogus, 1995). The host institution's primary means of measuring critical thinking at the development stage of the study was in relation to achieving a grade A in theoretical assignments. Specifically measuring critical thinking in clinical practice was not addressed as a discrete entity. This, however, is also the case in the author's experience of alternative educational institutions.

1.2.1 *Current Evaluation of Project 2000*

In relation to the implementation of Project 2000 courses, Jowett et al., (1994) reported the perceptions of students, clinical staff, higher education staff and service managers regarding course outcomes. Key findings were:

Early Project 2000 qualifiers demonstrate that the principles of courses have been translated into practice, and practitioners feel well prepared and able to identify advantages of their particular courses;

Principal's and course leader's satisfaction that the aim of producing knowledgeable doers or reflective practitioners with an holistic appreciation of the patient and their needs were evidenced by positive feedback from rostered service placements.

A typical response by senior managers was their belief that the 'health' and 'holistic care' model underpinning project 2000, was creating nurses who are questioning,

assertive and equipped intellectually and professionally to contribute equally with other disciplines;

Students perceived themselves as more patient-centred, more holistic in their practice and less prepared to perpetuate ritualistic practices without a rationale. Very few voiced any real concerns as to their ability to cope with the demands of being a staff nurse. Although the assessment of intellectual outcomes were not specifically addressed in the study. A typical example of subject descriptors of desired project 2000 outcomes were that the diplomate should be able to:

> " Critically analyse and synthesise material and engage in cogent argument";
>
> " Understand the research process and be critical of research methodology and findings that may be applied in practice";
>
> " Practice autonomously";
>
> " Give safe, compassionate, competent nursing care which acknowledges the individuality, stage of development and rights of the adult based on a model of nursing", (Jowett et al., 1994, p.4).

Phillips et al., (1993) examined the nature of the assessment of competence across the spectrum of Project 2000 courses. A key discovery was that assessment was most effective when dialogue in the form of the externalisation or making public of students' knowledge and practice is structured into the process. Within such a dialogic culture practice can be legitimately questioned, alternative possibilities explored and arguments analysed. They provide evidence that theory and practice are more often than not assessed in isolation, as opposed to "...at one and the same time." They further allude to the need for greater evidence of:

> The achievement of competencies which looks at theory and practice simultaneously;

> The construction of assessment documentation which facilitates the clear externalisation of learners analytic reflection upon clinical events and nursing or midwifery principles.

Critical thinking portrayed by the authors as reflective critique in this study is cited as integral to competent practice.

Ramprogus (1995, p.99) in an hermeneutic inquiry examined the effects of Project 2000 type curricular changes upon academic and professional standards. One such academic standard was that of reflective skills, defined as:

> " An ability to use critical thinking for analysing and synthesizing knowledge and practice."

Although critical thinking was not clearly defined, there appeared a participant consensus that learners had developed most of the reflective skills intended as an outcome of courses. These reflective skills, however, were perceived by some teachers to apply predominantly to coursework and could not be transferred to practice. This sentiment was mirrored also by student responses. In addition, there emerged an obvious disparity between conceptions of the construct critical thinking amongst respondents. Ramprogus concluded that considering learners' inabilities to apply reflective skills and knowledge to practice other than at a basic level, the production of knowledgeable doers was an unrealistic outcome of project 2000.

Although these studies refer in part to the importance of the construct critical thinking as a course outcome and provide conflicting evidence as to the development of the construct, little insight is forthcoming as to its discrete measurement, particularly in relation to its transfer to practice. Issues surrounding the transferability of coursework skills into practice are not exclusive to nursing. Over recent years the higher education community has come under scrutiny from the Government and employers in regard to its ability to ensure the development of personal transferable skills or core skills, predicated on the feasibility of such a notion. Bradshaw (1986)

posits that the concept emerged during the mid - 1980s amid encouragement from the then University Grants Committee, the National Advisory Body for public sector and higher education and the Council for National Academic Awards, for institutions to incorporate such skills into higher education curricula. Employers added their weight to such calls, perceiving that higher education was not delivering what they wanted, in terms of skills and threshold standards (Woollard, 1995). More recent attention has been given to the transferable skills debate within the Enterprise in Higher Education initiative and the National Council for Vocational Qualifications attempts to define core skills within General National Vocational Qualifications (GNVQ). Arguments, however, surround the issue of whether reductionist definitions of the core skills one could expect from a graduate can truly capture the universally characteristic graduate attributes of critical thought and a search for deeper understanding (Barnet, 1994). For Barnet, the word 'skill' implies predictability, routine, non-reflection and finiteness of action, whereas the essence of higher education is to go beyond such approaches. In addition to the problems of actually defining cognitive outcomes, there is much scepticism as to the concept of transferability upon which the debate is founded. Woollard (1995) points to the long held assumption that the attributes demonstrated in most traditional degree programmes can be readily transferred into very different areas. Many observers, he claims, have challenged this assumption that the trained mind can prove itself precisely by its ability to transfer knowledge and skills across boundaries. Fennell (1993) suggests that the idea of a graduate leaving university equipped with a set of multi - purpose intellectual skills may be an illusion. The reality he posits is that because there is no such thing as a context - free problem, people will tend to view problems from their disciplinary vantage point. Nickerson et al. (1985) also claim that generic thinking and problem solving skills alone have little transfer value in specialised content domains. Similarly, Oates (1992) notes that some forms of learning can hinder transfer. He cites for instance, moving from a QWERTY keyboard to another kind whereby some touch typing skills have to be actively

unlearned. The same questions must, therefore, be pertinent in regards to the transfer of intended intellectual outcomes such as critical thinking from nursing educational contexts and into real - world practice domains.

Previous studies related to the measurement of critical thinking as a distinct outcome of nursing education are predominantly American. They have thus far investigated the relationship of critical thinking to various factors and have utilised a series of standardised test instruments. These will be addressed in detail in chapter two.

Previous works related to nurse reasoning but not from a critical thinking perspective have investigated the clinical reasoning of student nurses or qualified practitioners and have focused predominantly on care planning and decision making in relation to establishing pathologies, interventions and locus of control. The collective conclusions drawn from these studies suggest nurses and student nurses use hypothesis-driven and cue -based data acquisition strategies in their reasoning and hypotheses are activated early in the reasoning process. Moreover, beginning nurses tend to perceive causal relationships between cues and states of health as opposed to probabilistic ones. Experienced nurses, however, deliberate client problems and interventions concurrently when planning care. Finally, nurses and students independent clinical decision making is qualitatively affected by their perceived locus of control (Itano, 1989; Tanner et. al. 1987; Westfall et al. 1986; Corcoran, 1986; Grobe et al. 1991; Fonteyn & Grobe, 1994; Tschikota, 1993). Evidence of this nature raises questions as to the appropriateness of teaching the nursing process as the predominant model of nurses' clinical thinking process in practice (Farrell & Bramadat, 1990). The nursing process by nature is linear and advocates the suspension of judgement and intervention planning until all the data has been acquired. By contrast, the evidence portrayed above suggests nurses generate early hypotheses and clinical inferences, whilst considering data, problems, patterns and outcomes simultaneously.

1.3 Gaps and Shortcoming in Current knowledge and Practice.

Little is known about the clinical reasoning or critical thinking processes of experienced, newly qualified and student nurses. Also missing from current knowledge and practice is specific evidence of the achievement of developing critical thinking ability in our Project 2000 /RN Dip HE learners and whether this can be identified in their concurrent practice-oriented reasoning. As previously identified a body of knowledge is being developed in America relating to critical thinking and the nursing profession but, to date, this is somewhat inconclusive as Pless & Clayton (1993, p.425) summarise below:

"Strong support for the impact of nursing education on generic critical thinking ability is lacking;

There is practically no evidence to support congruence between critical thinking and clinical judgement;

Strong support for the relationship between critical thinking and success in nursing education is lacking."

In addition to these issues there is a paucity of UK studies relating to critical thinking or student nurses' clinical judgement processes.

Beck et al (1992) and Pless & Clayton (1993) attribute the inconclusive results of these studies to invalid instrumentation which are not sensitive to a nursing context. That is, the overwhelming use of content independent trait or aptitude oriented psychometric tests as the sole measure, or in conjunction with other standardised tests. Examples of these are the Watson - Glaser Critical Thinking Appraisal, the Cornell Critical Thinking Test and the Ennis & Wier Critical Thinking Essay Test. Such commentators now advocate a multi-method approach to the investigation of domain specific critical thinking. One of the central limitations of the standardised

approaches is that they only test critical thinking through the medium of reading, as do written case simulations. The range of stimuli, however, which informs nurse's judgement processes in real time practice is more diverse. For example, nurses attend to auditory, tactile, visual and olfactory stimuli. Subtleties of form, colour, smell, texture and sound are not easily translated into written symbols (Fonteyn & Fisher, 1994). Another problem is that tests of this nature measure apparent possession of these skills and traits and their potential transfer to everyday or nursing situations, but do not provide evidence in their actual transfer to the performance of professional practice.

Evaluating such transfer and performance issues generally requires appropriate study over time and an avoidance of one - shot case study approaches in favour of investigations designed longitudinally (Marsland & Gissane, 1992). This, however, may be problematic particularly in the evaluation of somewhat complex phenomena. Should the evaluation of intended generalisable curricular outcomes be, for example, over the course of a curriculum alone or during post curricular practice, or both? Beck et al. (1992) advocates that there are many questions relating to how best to teach, practice or investigate critical thinking in nursing and innovative studies are required to provide evidence of critical thinking development in nursing education and practice. They also point to the desirability of more qualitative approaches to the identification and measurement of critical thinking processes in the nursing domain, as a means of developing appropriate methods of measuring nurses' critical thinking performances.

Furthermore, given the professional desire for a paradigm shift in terms of viewing the individual from a healthy and holistic perspective and the preponderance of studies of reasoning focusing on issues of diagnosis and ill-health. It may now be timely that this issue be addressed as a potential vehicle in order to determine reasoning processes or degrees of achievement of this outcome.

Another central consideration in this overall question is: do we specifically teach learners the concepts related to this theoretical construct or do we rely on critical thinking ability developing incidentally, as a consequence of a curriculum designed generally for another purpose, that is, to produce a Registered Nurse? Glaser (1985) believes there exists little evidence that students acquire critical thinking skills as a necessary by-product of studying a given subject. He further asserts that the research literature indicates that if the objective is to develop the skills of critical thinking and an attitude of reasonableness in students then specific training is required. McPeck (1981; 1990) contends, however, that the teaching of domain specific knowledge and skills is more influential in developing critical thinking skills which on the whole is domain restricted.

Leaving this to chance could prove costly for clients, practitioners, educationalists and managers in the future. The information explosion has brought with it new levels of complexity to every field, especially health care (Miller, 1987; Brigham, 1993). This and the growing prospect of future expansion of the nurse's role may impinge dramatically on their professional decision making. Decision-making is purported to be an essential component of nursing practice (Joseph et al., 1988; Jenkins, 1985; Rhodes, 1985; Pardue, 1987). As decisions become more complex, the dimensions of thinking preceding those decisions must ensure adequate deliberation upon these complexities. In a healthcare context, the human condition as unique holistic individual does not lend itself to indiscriminate application of standardised procedures. Clinical judgements must derive from reasoning strategies reflective of situational complexity. The potential implications of not practising critical thinking in nursing practice may result in clinical decisions which do not accurately represent the client's context. Decisions or interventions may, for example, reflect the value systems of health care professionals but not take into account patients or families

norms or beliefs about health, coping with ill - health, interacting, dying or grieving (Carnevali & Thomas, 1993).

Nurses may also fail to attend to appropriate available data during decision making and problem solving processes. Alternative perspectives and, therefore, alternative solutions may be excluded. The consequences of such omissions may mean failure to identify potential or existing problems. Treatment or organisational requirements may subsequently be neither planned nor executed appropriately. Nurses may incorrectly interpret data, incorrectly assess need and, therefore, incorrectly or inappropriately prescribe interventions for wrong or non-existent phenomena. Furthermore, nurses may make vague generalisations when data exists to enable specific diagnosis or action (Carnevali & Thomas, 1993).

Consequently, there are now calls to effectively combine teaching learners 'what to think' with strategies for teaching learners ' how to think ' , a central tenet of the educational paradigm (Walters, 1990).This need is evermore pressing in light of recent criticisms relating to Project 2000 programmes to question their suitability for preparing the nurse for the rapidly changing scene of health care and associated service provision (Kenworthy, 1993).

In summary, the background to the problem consists of several issues presented in table 1.3.1.

Table 1.3.1 Summary of Problem Issues.

1. A professional consensus regarding the relationship between competent clinical practice and critical thinking appears to exist;
2. Nursing education in general values critical thinking as an educational outcome;
3. Critical thinking is purported to be an intended outcome of the new preparation for practice adopted by the United kingdom (Project 2000);
4. Compelling evidence regarding ability of nursing education to develop critical thinking in its learners does not exist;
5. There exists criticism of the methodologies utilised in prior studies intended to measure critical thinking as an outcome of nursing education;
6. There is little evidence of qualitative approaches being used in the examination of learners critical thinking abilities;
7. Evidence regarding the achievement of critical thinking as a project 2000 curricular outcome is awaited.

In light of the above issues an evaluation of curricular performance in relation to the achievement of intended critical thinking outcomes is required. The perceived value of this work is twofold. Achievement of the institution's stated curricular outcomes will be tested. The study findings may affirm the efficacy of curricular or teaching

strategies, or inform the development of suitable strategies to enhance critical thinking abilities in student nurse's professional reasoning and judgements.

1.4 Research Purpose:

The purpose of this study is, therefore, to explore and describe the impact of a Project 2000, Common Foundation Programme Curriculum on the critical thinking abilities of a group of student nurses. In the pursuit of this purpose the following questions will be addressed:

1.5 Research Questions:

1. Does the current Common Foundation Programme curriculum facilitate the development of critical thinking ability in student nurses?

2. Can critical thinking be identified in student nurses' reasoning / judgement processes?

3. Does student nurses' reasoning change in complexity over the course of the Common Foundation Programme?

Having outlined the background to the problem, the next chapter will review aspects of the considerable literature pertaining to critical thinking.

CHAPTER TWO

REVIEW OF THE LITERATURE

2.1 Introduction

The range of literature reviewed included theoretical and empirical works from the disciplines of general education, philosophy, cognitive psychology, nursing practice and nursing education. The literature search involved a variety of manual and electronic methods both in the United Kingdom and in the United States of America. Initially the electronic methods included Library on-line catalogues and CD-ROM databases, i.e. Medline, Cinahl, Psych-lit. As the study progressed, however, access to some of these databases became possible via the internet. Search terms included: critical thinking; critical thinking and nursing; critical thinking and education; critical thinking and nursing education; critical thinking and student nurses; critical thinking and professional judgement; clinical reasoning; informal logic; protocol analysis; think aloud technique.

This chapter will be in two parts. Part one will focus on general non - nursing theoretical literature including general societal issues, the divergent use of the term critical, a short historical perspective, a selection of definitions, divergent views in respect of the constituents of critical thinking and the role of logic in critical thinking. Part two will focus on nursing oriented theoretical and empirical literature. This will include the emergence of critical thinking as an issue in nursing, the need for critical thinking in nursing, the relationship between critical thinking and the nursing process, nursing oriented models of critical thinking, educational issues, studies relating to critical thinking in nursing. The concluding sections include a synthesis of the literature in the formulation of a conceptual definition of critical thinking that will form the basis for the operational definitions that underpinned the study's subsequent methods.

2.2 Part One.

Critical thinking is a highly valued ability and is commonly cited as a desirable educational outcome, particularly in relation to professional and higher education (D'Angelo, 1971; Frederickson & Meyer, 1977; Anis & Anis, 1979; Brabeck, 1983; Pardue, 1987; McMillan, 1987; Norris, 1985). Society as a whole is said to benefit from a critically thinking citizenry and indeed this is said to form the very basis of democracies and fundamental to maintaining the democratic way of life (Glaser, 1985; Paul, 1984). Conversely, democracies find it difficult to function when their citizens are inclined to be unreasonable. Accordingly, Lipman (1987, p.153) posits the view that 'reasonableness' is possibly the most important characteristic of the educated person and that "...educated people are not only well learned, they think well." Walters (1986, p.234) proposes: " A democratic society is predicated upon two necessary conditions: first, that public policy is made by an informed and educated citizenry, which has carefully evaluated a variety of opposing arguments and viewpoints before coming to its collective decision; second that alternative perspectives are examined with an open - minded tolerance, even if not ultimately agreed with." The prospect of a society making informed rational and tolerant decisions is dependent upon and proportionate to the critical thinking abilities of each individual participant in the democratic process. Critical thinking and democracy are perceived as so synonymous in the United States of America that many of the abilities often associated with lists of critical thinking skills are similar to the abilities listed in Remy's (1980) Handbook of Basic Citizenship Competencies. There is, consequently a social and pragmatic need for critical thinking and objective evaluation in collective decision making; in order to avoid the danger of public policy being at the beck and call of glib rhetoricians who appeal more to the emotions than to the reason of their audiences.

The 'thinking' component of the term is taken to refer to the process of thinking in general, defined here as: the mental representation and manipulation of internal and

external symbols derived from perceptual experience (Smith, 1990; Evans, 1983; Tomlinson, 1981). Such a definition, however, fails to illustrate the concomitant thinking skills, of which the list is potentially very long indeed. Coles & Robinson (1989, p. 10) cite Lipman's (1983) position that 'thinking skills is a catch-all phase in that:

" It ranges from very specific to very general abilities, from proficiency in logical reasoning to the witty perception of remote resemblance's, from the capacity to decompose a whole into parts to the capacity to assemble random words or things so as to make then well-fitting parts of a whole, from the ability to explain how a situation may have come about to the ability to foretell how a process will likely eventuate, from a proficiency in discerning uniformity's and similarities to a proficiency in noting dis-similarities and uniquenesses, from a facility in justifying beliefs through persuasive reasons to a facility in generating ideas and developing concepts, from the capacity to solve problems to the capacity to circumvent them or forestall their emergence from the ability to evaluate to the ability to re-enact."

The proverbial pit is potentially bottomless because it consists in short of the inventory of mankind's intellectual powers. Does the addition of the prefix 'critical' thus imply a clear distinction from the above inventory in the form of another type, or a quality of thinking?

The adjective 'critical' is from the Greek, meaning to question, to discern, to choose, to evaluate, to make judgement (Flexner, 1987). The term is applied in a variety of contexts, for example, managers refer to 'critical path analysis' , health care practitioners refer to 'critical care units' and to the client's condition as 'critical' . Educationalists espouse the need to engender 'criticality' and 'critical thinking' in their students as a mark of intellectual attainment and craftsmanship. This diversity exposes how the term can apply to specific frames of reference, of which, thinking is only one.

Dictionary definitions also explicate the variety of accepted usage. The Collins English Dictionary (1992) offers the following applications:

1. Containing or making severe or negative judgements;
2. Containing careful or analytical evaluations;
3. Of or involving a critic or criticism;
4. Of or forming a crisis; crucial; decisive; a critical operation;
5. Urgently needed; e.g. critical medical supplies;
6. Physics of, denoting, or concerned with a state in which the properties of a system undergo an abrupt change; e.g. a critical temperature.

Taken collectively the above examples indicate that the term critical may be applied to an act of judgement by others concerning the merit of activity undertaken. Such a judgement should be rigorous and may be negative although not necessarily so.

Critical may also indicate that unless certain actions are taken or certain components utilised, negative consequences will ensue or opportunities may be missed. Finally, critical also suggests that at certain points given certain conditions the composition of phenomena undergo change.

Ferguson (1986) lists synonyms of critical in three categories, which Sheehan (1992) labels unflattering, important and unsafe, (table 2.2.1)

Table 2.2.1 Categorical Synonyms for the Adjective Critical (Sheehan, 1992)

Unflattering	**Important**	**Unsafe**
Captious	Accurate	Dangerous
Carping	Analytical	Perilous
Cavilling	Diagnostic	Risky
Censorious	Discerning	Touch & Go
Derogatory	Fastidious	
Disparaging	Grave	
Fault-finding	Penetrating	
Nit-picking	Perceptive	
	Precise	
	Serious	

Although all of the above categories could conceivably apply to thinking. The important category appears to be the most positive and would most aptly be applied to thinking in order to denote a distinct qualitative standard in that they imply a

certain discipline and open-mindedness. Yet, this list also belies similarities to that of Lipman's. In relation to identifiable characteristics Halpern (1989, p.5) asserts "The critical part of critical thinking denotes an evaluative component." Marzano et al. (1988, p.17) echo this and offer a distinction between critical and creative thinking by claiming: "... critical thinking is primarily evaluative and creative thinking is primarily generative." These characteristics, however, do little in the way of facilitating a clear distinction in the way they appear to in Lipman's example. Could it be that critical thinking is also a 'catch-all' phrase or does combining the two terms, critical and thinking, actually imply a particular approach, type, or a degree of quality?

McPeck (1981, p.12) believes critical thinking merely "...denotes a particular type of thinking." and that rationality is the true qualitative measure with critical thinking comprising a particular aspect or subset of this. Marzano et al. (1988, p.17), however, believe critical thinking should not be considered a cognitive process comparable to problem solving and decision making. " Instead, these terms imply judgements about the quality of the thinking involved - a judgement about the relation of thinking to some ideal model." Thus as we solve a problem or make a decision we do it more or less critically.

What then is the ideal model and to what extent does critical thinking contribute to this? To address this question one must first ask, what is the background to this construct and what does critical thinking mean?

2.3 Historical Perspective

The study of thinking per se has evolved from two distinct perspectives, that of philosophy and psychology. Philosophers it is said, are concerned with the outcomes or products of human thinking in the form of reasoned judgements and beliefs, whereas psychologists are concerned more with the processes involved in thinking.

Thus philosophers argue that the purpose of thinking is deciding what to believe or do whilst psychologists maintain that thinking is making sense out of experience, constructing meaning and understanding (Splitter, 1991).

The roots of the philosophical interest extend back to the classical past. In the western world, philosophy preceded the growth of what we know as science by some 2000 years. To think or reason, according to early philosophy, was to take the stance of the objective and contemplative spectator in the discovery of truth. Inquiry was seen as one of the philosopher's primary tools in the quest for truth. Indeed, the spirit of inquiry is woven through the entire history of philosophy and has shaped many of the modern notions of science.

In the mid-19th century scholars started to view the human mind as a 'working mechanism' complete with underlying operations which could be studied scientifically (Rowe 1985). The observations of Darwin (1859) suggested a correlation between the evolutionary increase in the complexity of animal behaviour and the increasing size of animals' brains. This led to increased attention in attempting to identify the operations that constituted thinking. Wundt, (1879) the founder of the psychological laboratory, began to investigate the basic building blocks of all cognition, thought to be sensations and perception.

Since then psychological study has taken many forms and various schools have developed as a result; examples include: Gestalt psychology, behaviourism, information-processing and cognition. Cognitive psychology represents the most recent approach to the study of thinking. Information-processing focuses on how humans acquire, transmit, store and transform information. Many of the successful analyses of thinking, particularly in relation to the limitations of human memory capacity, have been due to the adoption of this approach. Information processing theory has also made possible the development of powerful computer models which apparently simulate human thought and lead to the prospect of artificial intelligence.

Quellmalz (1987) offers a distinction between reasoning skills as proposed from a philosophical and psychological perspective which further illustrates the above (Table 2.3.1).

Table 2.3.1 Reasoning Skills from Philosophical & Psychological Perspectives

Critical Thinking Skills (Philosophy)	**Problem –Solving Strategies (Psychology)**	**Probable Dominant Cognitive processes (Psychology)**
Clarification:	Identify the problem	Analogical
Identify or formulate a question,	Identify essential elements and terms	Analysis and comparison
Analyse major components		
Define important terms		
Judge credibility of support, the source, and observations.	Identify appropriate information, content, and procedural schemata.	Analogical - Analysis and comparison; component evaluation.
Inference: Deduction, Induction, Value judgements, Fallacies	Connect and use information to solve the problem	Infer / interpret relationships among components
Use Criteria to judge adequacy of solution	Evaluate success of solution	Evaluate effectiveness of specific and general strategies

(Quellmalz, 1987, p.89)

Theories of critical thinking can also be traced to the Greek philosophers and these views have been instrumental in the development of current conceptions of this construct. It was Socrates, some 2,400 years ago, who became aware that by probing and questioning people often could not rationally justify their confident claims to knowledge. He was also disturbed by what he perceived to be the immoral use of critical thinking by sophists of the time and hoped that probing challenges to loose reasoning would lead to a recognition of reason as a force for promoting moral good. Instead, confused meanings, inadequate evidence or self-contradictory beliefs lurked beneath persuasive but largely empty rhetoric. Furedy & Furedy (1985, p.54) describe how Socrates embraced the questioning critical attitude, proclaiming " The uninquiring life is not the life for man." He came to believe that all traditions and assumptions were open to critical examination and should be regularly subjected to such. For it is the purposeful thinking about ideas or assumptions and the weighing

of logical arguments against one another which assists in clarifying those ideas and positions (Anderson, 1961).

These influences are also apparent in Platonism. Plato, a student of Socrates, describes thinking as "...either a dialogue in the soul involving mental words... or a spiritual activity of inspecting or recollecting forms (words) and discerning their natures and interrelations." (Aune, 1967, p.101). Implicit in this description, is the assumption of a clear relationship between thinking and language. Plato believed education should not only provide information but aim to enable students to question, examine and reflect upon ideas and values. Aristotle's Nichomachean Ethics revealed his belief in the relationship between thinking and the intellect and that prolonged thinking about phenomena resulted in clarification (Oswold, 1962). Aristotle also asserted that critical thinking combined abstract thinking and logical thinking. He further connected thinking and values, developing the idea of a link between moral reasoning and critical thinking. History is replete with further examples of proponents stressing the need and benefits of critical thinking to society; these include: St Augustine, St. Thomas Aquinas, Rene Descartes, Immanuel Kant, John Locke and David Hume.

A more recent contribution to the critical thinking debate was introduced by Dewey (1916) who used the term reflective thinking in a manner synonymous with current conceptions of critical thinking. Dewey (1916 p.158) proposed that thinking arose from a situation of ambiguity which causes dilemmas and requires the consideration of alternatives. Thinking of this nature, he claims, includes "...the sense of a problem, the observation of conditions, formation and rationale, elaboration of a suggested conclusion and active experimental testing." In the event of certain results or consequences arising from the experimental testing, then the validity of alternatives can be established. Dewey suggested that critical thinking is a subset of the reflective process involving, thorough assessment, scrutiny and the drawing of

conclusions in relation to the issue at hand. This assessment of information and decision making contributes to judgement. The importance of critical thinking in this process according to Dewey is that problems are subject to healthy scepticism and timely suspension of judgement. Dewey's view of education is that it should facilitate a reflective process, be student centred and realistic in order to develop students intellectually and morally.

2.4 Critical Thinking: What is it?

Other more recent contributors to the critical thinking paradigm are Glaser (1941), Ennis (1985), McPeck (1981), Paul (1992), Perry (1970), Brookfield (1987), Kurfiss (1988), Norris (1990) and Siegal (1991). Each have contributed to the plenitude of definitions and interpretations of critical thinking but no single widely accepted definition of this construct is apparent (Michael et al., 1980; Landis & Michael, 1981). It also appears that the construct is neither clearly understood nor systematically applied (Katoaka - Yahiro & Saylor, 1994). Brookfield (1987), drawing on the works of others, suggests that it has been equated with the development of logical reasoning abilities (Hallet, 1984; Ruggerio, 1975) with the application of reflective judgement (Kitchener, 1986), with assumption hunting (Scriven 1976), and for Hullish & Smith (1961, p.11), with the"... creation, use, and testing of meaning." Ennis (1985, p.45) defines critical thinking as " Reasonable, reflective thinking that is focused on deciding what to believe and do." Halpern (1989, p.37) sees critical thinking as " Thinking that is purposeful, reasoned, and goal directed." Facione (1984, p.257) proposes that a suitable operational definition of critical thinking is " The development and evaluation of arguments." Blair (1985) also maintains that argumentation is central to critical thinking. Landis & Michael (1981, p.1148) view critical thinking in broad terms, as involving "...an individual's becoming aware of the demands of a given environmental circumstance (typically a problem situation) and of evaluating numerous decision alternatives prior to taking an action that in many but not all instances may lead to the solution of a problem."

These somewhat superficial descriptions are dwarfed by that of Scriven and Paul (1992, p.1) who posit that:

> "Critical thinking is the intellectually disciplined process of actively and skilfully conceptualising, applying, analysing synthesising and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness. It entails proficiency in the examination of those structures or elements of thought implicit in all reasoning: purpose, problem or question-at-issue, assumptions, concepts, empirical grounding, reasoning leading to conclusions, implications and consequences, objections from alternative viewpoints and frames of reference."

Watson & Glaser (1991, p.29) offer a potentially more manageable alternative in the form of " Critical thinking is a composite of attitudes, knowledge and skills that include:

1. Attitudes of enquiry that involve an ability to recognise the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true;
2. Knowledge of the nature of valid abstractions, and generalisations in which weight or accuracy of different kinds of evidence are logically determined;
3. Skills in employing and applying the above attitudes and knowledge."

Alternatively, McPeck (1981, p.6) claims "Critical thinking involves a certain scepticism, or suspension of assent, towards a given statement, established norm or mode of doing things. This scepticism might ultimately give way to acceptance, but it

does not take truth for granted. Instead , it considers alternative hypotheses and possibilities." McPeck (p.13) further offers what he calls a more complete description by describing critical thinking as " the disposition and skill to do X in such a way that E (the available evidence from a field) is suspended (or temporarily rejected) as sufficient to establish the truth or viability of P (some proposition or action within X)."

Although the definitions above reflect certain unique elements, commonalities are also apparent. Critical thinking can clearly be associated with knowledge, cognitive skills, complex reasoning, argumentation, beliefs, action, problem identification, evidence and the envisioning of alternative possibilities or frames of reference. These elements contribute to a purposeful reasoned interaction between an individual and received information.

The literature pertaining to critical thinking is vast. Paul (1985) cited the identification of 1894 related articles from a variety of disciplines in the preceding seven years. It can be assumed that this has been added to significantly since then. In addition to the divergent definitions of critical thinking several distinct positions emerge from the literature and the major disputes according to Blair (1987) and Hagar (1991) include questions such as:

1. What exactly constitutes critical thinking?

2. To what extent does logic play a part in critical thinking?

3. Is critical thinking largely general across disciplines or is it largely specific to each different discipline?

4. How might critical thinking best be taught?

Hager (1991) contends that answers to these questions are complicated since they are not only interrelated but multidisciplinary by their very nature.

Given the purpose of this study aspects 1 and 2 of the critical thinking debate will serve as the primary focus for clarification of the phenomena to be observed and methodological decision making, with point 4 possibly arising later in relation to the discussion of findings.

2.5 What Constitutes Critical Thinking?

Critical thinking is seen by protagonists as a type of thinking requiring the acquisition, combination and application of a variety of what have been called: aspects, factors, skills, abilities, elements, behaviours, and dispositions of critical thinking. For example, Russell (1943; 1963) claimed critical thinking consisted of the following factors:

The attitudes of questioning and suspending judgement (attitude factor);

The application of the methods of logical analysis (conotive/functional factor);

Evaluating in terms of some norm, standard or consensus (judgement factor);

Acting on the basis of the analysis.

Anderson (1944) emphasises certain skills involving both facts and logic. That is:

Identifying specific facts;

Selecting relevant facts;

Organising facts in terms of meaningful sub-topics;

Arranging sub-topics in logical order;

Making inferences from specific facts and from trends;

Distinguishing between fact and opinion;

Recognising situations in which insufficient evidence makes it difficult or impossible to draw a clear-cut conclusion.

Dressel & Mayhew (1954, p.37) also proposed a series of critical thinking skills based on their extensive examination of professional literature and research in the field. They contend that critical thinking constituted "...the sum of certain rather specific behaviours which could be described and which could be inferred from student acts."

These include:

1. Identifying central issues;
2. Recognising underlying assumptions;
3. Evaluating evidence or authority by;

a. Recognising stereotypes and clichés.

b. Recognising bias and emotional factors in a presentation.

c. Distinguishing between verifiable and unverifiable data.

d. Distinguishing between relevant and non-relevant..

e. Distinguishing between essential and incidental.

f. Recognising the adequacy of data.

g. Determining whether facts support a generalisation.

h. Checking consistency.

4. Drawing warranted conclusions.

Despite the specificity of Dressel and Mayhew's list of skills they did not describe them beyond the level of labels. Explanations provided for the above skills were in the form of statements of importance and consequences of non utilisation as opposed to specific skill criteria (Beyer, 1985).

D'Angelo (1971), however, believed critical thinking constituted a combination of the following ten attitudes and various linguistic, logical, empirical, methodological and valuational skills totalling fifty in all (Tables 2.5.1& 2.5.2). These will be shown in their entirety to give the reader an idea of the breadth and complexity of some conceptions of critical thinking.

Table 2.5.1 *D'Angelo's Critical Thinking Attitudes:*

1. Intellectual curiosity,
2. Objectivity,
3. Open-mindedness,
4. Flexibility,
5. Intellectual scepticism,
6. Intellectual honesty,
7. Being systematic,
8. Persistence,
9. Decisiveness,
10. Respect for other viewpoints.

Table 2.5.2 *D'angelo's Critical Thinking Skills Repertoire*

1. Determining the meaning of a term or a statement,	26. Recognising the black or white fallacy,
2. Recognising ambiguities,	27. Recognising equivocations,
3. Defining key terms,	28. Recognising the fallacy of begging the question,
4. The analysis of emotional language,	29. Recognising the fallacy of the complex question,
5. Avoiding vague terms,	30. Recognising hasty generalisations,
6. Interpreting words with regard to context,	31. Recognising the gambler's fallacy
7. Avoiding slanting judgements,	32. The false cause fallacy,
8. The analysis of clichés	33. Distinguishing a fact from an opinion,
9. The realisation that the word is not the thing	34. Distinguishing factual reports from inferences,
10. Distinguishing between denotation and connotation	35. Recognising and defining a problem,
11. Avoid mistaking figurative language for literal language	36. Using evidence to test beliefs,
12. Recognising the etymological fallacy,	37. Seeking explanations,
13. Giving concrete meaning to abstract terms	38. An analysis of the appeal to ancient wisdom,
14, Recognising and justifying assumptions,	39. An analysis of the appeal to old age,
15. Judging whether statements contradict each other,	40. Judging common sense,
16. Recognising the fallacy of the irrelevant conclusion,	41. Judging faith,
17. Recognising the fallacy of arguing against the man	42. Recognising the fallacy of authority,
18. Recognising the fallacy of appealing to force,	43. Judging intuition,
19. Recognising the fallacy of arguing from ignorance,	44. An analysis of the appeal to immediate experience,
20. Recognising the fallacy of appealing to the sentiments	45. Deduction,
21. Recognising the fallacy of appealing to the multitude,	46. Induction,
22. Recognising the fallacy of composition,	47. Scientific method,
23. Recognising the fallacy of division,	48. The consistent use of a principle in ethics,
24. Recognising the fallacy of extension,	49. Justifying the standards used in ethics,
25. Recognising the fallacy of prejudicing the issue,	50. The realisation that an ethical dispute may not be resolvable.

D'Angelo's (1971) conception obviously focuses upon the evaluation of evidence, logical competence and logical argumentation. Moreover, he furnishes useful descriptions and examples of these attitudes and skills and stipulates that this is not an exhaustive list of all critical thinking skills. It is, however, a representation of the many different skills which in his view are required in the development of critical thinking ability.

In contrast, Brown & Cook (1971) cite only four "critical-mindedness" skills although when compared to other conceptions some of these could be viewed as more like affective dispositions. Brown & Cook (1971) did not offer detailed descriptions of their skills but they include:

Refraining from jumping to conclusions;

Evaluation of given sources of information;

Analysis of related parts of a problem;

Retention of an open mind.

Glaser (1985) asserts critical thinking involves three principle elements:

An attitude of being disposed to consider in a thoughtful, perceptive manner the problems and subjects that come within the range of one's experience;

Knowledge of the methods of logical enquiry and reasoning;

Skill in applying these methods.

Glaser (1985) also refers to certain behaviours relevant to a critically thoughtful approach to problem solving which essentially resemble skills these include:

Recognising unstated assumptions and values;

Comprehending language and using it with accuracy and clarity;

Appraising evidence and evaluating arguments;

Drawing inferences or conclusions and testing them;

Revising ones attitudes or judgements where the evidence persuades one to do so.

Finally, Glaser (1985) alludes to two attitudinal components that critical thinkers must be disposed to, that is, they should:

<u>listen</u> to another person's presentation or argument no matter whether they agree with you or not;

To <u>understand</u> the other person's point of view.

Glaser's (1985) attitudinal components as with other conceptions appear to reflect dispositions as opposed to skills. The latter attitudinal component according to

Glaser (1985) broadens one's ability to accept differences in perception or values between one's self and others, and with the emotional perspective being represented by the assertions of others.

The knowledge and skill components are purported to involve the examination of a stated belief to see if the presented evidence supports it or the further conclusions to which it leads. Such examination requires recognition of problems and the pertinent factors bearing upon them, consideration of possible explanatory hypotheses, formulation of feasible means of meeting those problems, and logical organisation or pertinent information.

For Ennis (1985) critical thinking involves: "reasonable" thinking, a determination to analyse arguments carefully, the seeking of valid evidence, and the subsequent reaching of sound conclusions. The outcome of critical thinking for Ennis is fair-mindedness, objectivity, and commitment to clarity and accuracy. Achievement of these operations he contends, requires the possession or acquisition of certain abilities, the application of various sub abilities and appropriate criteria and the employment of characteristic dispositions. The sub abilities and criteria are far too numerous to reproduce here, although the abilities span the core skills of elementary clarification, basic support, inference, advanced clarification, and strategy and tactics. Ennis's (1985, p.54) specific abilities include:

1. Focusing on a question;
2. Analysing Arguments;
3. Asking and answering questions of clarification and challenge;
4. Judging the credibility of a source;
5. Observing and judging observation reports;
6. Deducing and judging deductions;
7. Inducing and judging inductions;
8. Making and judging value judgements;

9. Defining terms and judging definitions;

10. Identifying assumptions;

11. Deciding on action;

12. Interacting with others.

Ennis's (1985, p.54) Specific critical thinking dispositions include:

1. Seek a clear statement of the thesis or question;

2. Seek reasons;

3. Try to be well informed;

4. Use credible sources and mention them;

5. Take into account the total situation;

6. Try to remain relevant to the main point;

7. keep in mind the original or main point;

8. Look for alternatives;

9. Be open -minded:

   (a) Consider seriously other points of view than one's own ("dialogical thinking")

   (b) Reason from premises with which one disagrees - without letting the disagreement interfere with one's own reasoning ("suppositional thinking")

   (c) Withhold judgement when the evidence and reasons are insufficient.

10. Take a position (and change a position) when the evidence and reasons are sufficient to do so;

11. Seek as much precision as the subject permits;

12. Deal in an orderly manner with the parts of a complex whole;

13. Be sensitive to the feelings, levels of knowledge, and degree of sophistication of others;

14. Use one's critical thinking abilities.

Until the relatively recent addition of dispositions, Ennis's conception of critical thinking reflected a "pure skills" model. Objections to the somewhat overwhelming list of abilities and concomitant criteria centred on the proposition that a person could be a critical thinker if they merely possessed the requisite abilities. No reference was made to the student's actual application of their skills (Siegal, 1988). This presented the possibility that a person may be regarded as a critical thinker by merit of passing tests designed to assess these skills, but consequently may infrequently or never think critically in practice. This prospect appears, however, to have been recognised, because in Marzano et al's (1988) feature of Ennis's "Goals for a Critical Thinking Curriculum" the addition of disposition number 14 clearly advocates use and not merely possession of critical thinking skills. Ennis (1985, p.47) also appears to make the case for application of skills as integral to critical thinking, by asserting that critical thinking portrays the practical side of higher order thinking. He contends that " Deciding what to believe or do is a practical higher-order thinking enterprise, and most practical higher-order thinking activity is focused on deciding what to believe or do." Thus, Ennis's constituents of critical thinking now incorporates a skills plus dispositions plus tendency to use conception. The majority of the dispositions presented, however, appear merely as extensions to the identified abilities. It is the dispositions of looking for alternatives, being open minded, changing positions, being sensitive to the feelings and sophistication of others, and use of critical thinking skills which are reflective of affective tendencies which require a certain level of motivation and commitment to operationalise and maintain them.

In reaction to the assertions of other commentators in the field regarding the issue of critical thinking constituents, McPeck (1981;1990) claims critical thinking constitutes little in the way of so called general or transferable reasoning skills, but merely a disposition and appropriate knowledge. Though saying little pertaining to the former, McPeck identifies reflective scepticism as the prevailing disposition, exclusively dependant upon context - specific knowledge and information of the field in which

critical thinking is to be conducted (epistemological specificity). To McPeck (1981; 1990) scepticism refers to the suspension of assent towards a given in whatever form, until careful examination of the evidence and alternatives warrants acceptance. Scepticism, however, should not be habitual or indiscriminate but judicious, tempered by experience and be reflective. Reflective in this case means the application of criterion which distinguishes judicious scepticism from incorrect or frivolous scepticism, as determined by the norms and standards of the subject area in question. McPeck asserts that this is contingent on some knowledge of the particular field, without which the thinker could not know when, and how to apply reflective scepticism. In short McPeck (1981; 1990) views the major constituents of critical thinking as:

A Knowledge Component: comprising knowledge based skills whose general range of applicability is limited by the form of thought or kind of knowledge being called upon;

A Critical Component: consisting of the ability to reflect upon, to question effectively, to suspend judgement or belief about the required knowledge composing the problem at hand.

Paul (1984;1991;1992), however, contends that critical thinking constitutes two distinct forms each comprising discrete skills and motives. For example, if thinking is conducted and disciplined to serve the vested interests of a particular individual or group, excluding the interests of other relevant persons or groups, then the thinking is "sophistic" or "weak sense" critical thinking. This is understood to comprise a set of discrete micro-logical skills, as follows:

Comparing and contrasting ideals with actual practice;

Thinking precisely about thinking: using critical vocabulary;

Noting significant similarities and differences;

Examining or evaluating assumptions;

Distinguishing relevant from irrelevant facts;

Making plausible inferences, predictions, or interpretations;

Giving reasons and evaluating evidence and alleged facts;

Recognising contradictions;

Exploring implications and consequences.

Paul (1991) posits the above to be ultimately extrinsic to the person, that is, skills that can be added on to other learning which contributes to the development of "technical reason." Conversely, if the thinking is disciplined to the extent that it considers the interests of diverse persons or groups then this is critical thinking conducted in a "fairminded" or "strong sense." Thinking in this sense is understood to consist of the following integrated macro-logical skills:

Refining generalisations and avoiding oversimplifications;

Comparing analogous situations: transferring insights to new contexts;

Developing one's perspective: creating or exploring beliefs, arguments, or theories;

Clarifying issues, conclusions, or beliefs;

Developing criteria for evaluation: clarifying values and standards;

Evaluating the credibility of sources of information;

Questioning deeply: raising and pursuing root or significant questions;

Analysing or evaluating arguments, interpretations, beliefs or theories;

Generating or assessing solutions

Analysing or evaluating actions or policies;

Reading critically: clarifying or critiquing texts;

Listening critically: the art of silent dialogue;

Making interdisciplinary connections;

Practising Socratic discussion: clarifying and questioning beliefs, theories, or perspectives;

Reasoning dialogically: comparing perspectives, interpretations or theories;

Reasoning dialectically: evaluating perspectives, interpretations or theories.

The above abilities, according to Paul (1991) are intrinsic to the character of the individual. Effective utilisation requires insight into one's own cognitive and affective processes, leading to the development of "emancipatory reason", whereby the thinker is not blinded by their own values or beliefs. In this conception, Paul clearly links critical thinking to self awareness and morality and proposes the potential for a one-sided application of critical thought. Fundamental to this conception of critical thinking are a cluster of interrelated concepts which Paul (1991) labels: critical thinking;uncritical thinking; sophistic critical thinking; fairminded critical thinking and are defined thus:

"Critical Thinking

a) The art of thinking about your thinking while you're thinking so as to make thinking more clear, precise, accurate, relevant, consistent and fair.

b) The art of constructive scepticism.

c) The art of identifying and removing bias, prejudice, and one-sidedness of thought.

d) The art of self-directed, in-depth, rational thought.

e) Thinking that rationally certifies what we know and makes clear where we are ignorant.

Uncritical Thinking

a) Thought Captive of one's ego, desires, social conditioning, prejudices, or irrational impressions

b) Thinking that is egocentric, careless, heedless of assumptions, relevant evidence, implications, or inconsistency;

c) Thinking that habitually ignores epistemological demands in favour of its egocentric commitments.

Sophistic Critical Thinking

a) Thinking which meets epistemological demands insofar as they square with the vested interests of the thinker;

b) Skilled thinking that is heedless of assumptions, relevance, reasons, evidence, implications and consistency only insofar as it is in the vested interest of the thinker to do so;

c) Skilled thinking that is motivated by vested interest , egocentrism, or ethnocentrism rather than by truth or objective reasonability.

Fairminded Critical Thinking

a) Skilled thinking which meets epistemological demands regardless of the vested interests or ideological commitments of the thinker;

b) Skilled thinking characterised by empathy into diverse opposing points of view and devotion to truth as against self interest;

c) Skilled thinking that is consistent in the application of intellectual standards, holding one's self to the same rigorous standards of evidence and proof to which one holds antagonists;

d) Skilled thinking that demonstrates the commitment to entertain all viewpoints sympathetically and to assess them with the same intellectual standards, without reference to one's own feelings or vested interests, or the feelings or vested interests of one's friends, community or nation" , (p.47).

Of the above, Paul believes uncritical and sophistic thinking to be the most commonly employed in everyday thinking. He also asserts critical thinking exemplifies the perfections of thought (table 2.5.3) appropriate to a particular mode or domain of thinking, and contrasts the perfections and imperfections of thought thus:

Table 2.5.3 The Perfections and Imperfections of Thought

Clarity	Vs	Unclarity
Precision	Vs	Imprecision
Specificity	Vs	Vagueness
Accuracy	vs	Inaccuracy
Relevance	vs	Irrelevance
Consistency	vs	Inconsistency
Logicalness	vs	illogicalness
Depth	vs	Superficiality
Completeness	vs	Incompleteness
Significance	vs	Triviality
Fairness	vs	Bias or one-sidedness
Adequacy (for purpose)	vs	inadequacy

Paul, (1991)

Mastery of these general canons of thought enables the thinker to avoid the unclear, imprecise, vague, unreflective, inconsistent, superficial and inaccurate thinking associated with the uncritical thinker. These canons of thought can then be applied to what Paul identifies as the "elements of thought". Avoidance of the imperfections of thought requires an understanding and an ability to formulate, analyse and assess these elements as follows:

1. The problem or question at issue;
2. The purpose or goal of the thinking;
3. The frame of reference or points of view involved;
4. Assumptions made;
5. Central concepts and ideas involved;
6. Principles or theories used;
7. Evidence, data, or reasons advanced;
8. Interpretations and claims made
9. Inferences, reasoning, and lines or formulated thought
10. Implications and consequences involved.

The individual's ability to command the elements of thought in order to practise the perfections of thought, is contingent upon their ability to adjust or transfer thinking across differing question types and thought domains. Paul sees this as essential because it is no longer sufficient or effective to solely consider questions from a subject matter or monological perspective. Indeed, the most important questions currently facing individuals and nations focus on controversial and complex social, political, ethical, economic and religious issues of a multi-disciplinary or interdisciplinary nature, requiring non-algorithmic or multilogical thinking. Monological analysis will not solve multilogical problems. What is required is critical thinking in the "strong sense", the development of " strong sense" traits of mind which include the following characteristics:

Thinking independently;

Developing insight into egocentricity or sociocentricity;

Exercising fair-mindedness;

Exploring thoughts underlying feelings and feelings underlying thoughts;

Developing intellectual humility and suspending judgement;

Developing intellectual courage;

Developing intellectual good faith or integrity;

Developing intellectual perseverance;

Developing confidence in reason.

Equipped thus, thinkers are able to counteract egocentric and ethnocentric tendencies and engage in dialogical and dialectical reasoning. Dialogical thinking involves a dialogue or extended discourse between differing points of view or frames of reference. Dialectical thinking is dialogical thinking in which opposing points of view are subjected to tests of their strengths and weaknesses or their susceptibility to inconsistency or contradiction. Thus, Paul maintains that critical thinkers, in the strong sense, should become adept at considering the perspective of others in order

to develop a holistic sense of rationality by incorporating broader issues of values and consequences.

Halpern (1989, p.29) also subscribes to the skills plus dispositions conception and contends that critical thinking constitutes thinking that is: purposeful; reasoned; goal-directed; evaluative and self-monitored (metacognition). Fundamental to these descriptors are skills related to problem solving, formulating inferences, calculating likelihoods, argument analysis and decision making. Equally as important as critical thinking skills, is that of possessing or developing a critical thinking attitude, for: "Many errors occur not because people can't think critically, but because they don't." Furthermore, Halpern outlines several characteristics of critical thinkers which include: a willingness to plan; flexibility; persistence; and a willingness to self-correct.

Brookfield (1987), in an attempt to overcome the negative connotations, often ascribed to the term critical, suggests critical thinking is more than the indiscriminate challenging of claims, ideas or activities. He, thus, portrays critical thinking as: a productive and positive activity; a process as opposed to an outcome; that is manifestly varied according to the context in which it occurs and triggered by positive as well as negative events and is emotive as well as rational.

Moreover, critical thinking comprises four central components and attendant abilities in the form of:

1. <u>Identifying and challenging assumptions</u>: requires ability in identifying the assumptions underpinning statements, ideas, values and beliefs, skilled examination of their accuracy and validity and a willingness to jettison old assumptions in the face of evidence as to their inappropriateness to our lives.
2. <u>Challenging the importance of context</u>: involves an awareness of how context influences thoughts and actions, that practices, structures and language are never context-free and that our behaviours are culturally and temporally influenced.

3. Imagining and exploring alternatives: involves the realisation that in other contexts entirely different norms of employment organisation, political behaviour, media interpretation, and relationships are compatible and indeed ordinary.

4. Reflective scepticism: involves approaching claims to universal truth or ultimate explanations with doubt, not accepting the word of authority indiscriminately, particularly if experience dictates otherwise, and an ability to accept or initiate change.

Like Dewey (1916) and Watson & Glaser (1991) Brookfield, sees an action element in critical thinking which enables individuals to review important aspects of their lives, relationships and working practices and act upon them in an informed manner.

Norris (1985, p.40) also recognises the importance of context, alternative perspectives and affective dispositions by asserting that critical thinking is "A complex of many considerations." Such thinking constitutes:

1.A rationality in decision making that requires more than avoiding a standard list of errors in thinking;

2. The ability to assess the views of others and one's own views according to acceptable standards of appraisal;

3. Productive thinking, in the sense of conceiving of alternative courses of action and candidates for belief, before critically appraising which alternative to choose;

4. An awareness of the sensitivity of context to the processes and outcomes of thinking, and its potential effects on the quality of inference and inference appraisal;

5. A disposition to think productively and critically about issues.

Similarly, Blair (1988) conceives of critical thinking as constituting a disposition and ability to seek and test reasons for beliefs and actions. These he claims are usually expressed in the form of arguments. Blair (1988) also sees critical thinking as a complex intellectual virtue comprising skills and understanding. These include but are not restricted to:

An ability to formulate and assess arguments;

Sensitivity to language;

A sense of the importance of context;

An ability to apply and also to critically reflect on the appropriate criteria for judgement.

As a virtue of character, Blair (1988) contends that it includes a habit of critical reflection regarding the problematic assumptions held by oneself and others, plus the valuing of reasoned support for beliefs and actions. In addition to the abilities and dispositions position, Blair clearly associates critical thinking with the process of argumentation.

To Fisher (1990) critical thinking extends to the generation of appropriate questions whilst also comprising certain traits and skills such as:

learning how to question, that is, when to question and what to question;

a readiness to reason;

a willingness to challenge;

a desire for truth;

understanding oneself; (self awareness)

understanding others (being fair and open-minded).

In terms of critical thinking skills Fisher utilises and clarifies the meaning of Ennis's (1985) aspects thus:

1. Grasping the meaning of a statement - Is it meaningful?
2. Judging whether there is ambiguity in reasoning - Is it clear?
3. Judging whether statements contradict each other - Is it consistent?
4. Judging whether a conclusion follows necessarily - Is it logical?
5. Judging whether a statement is specific enough - Is it precise?
6. Judging whether a statement applies a principle - Is it following a rule?
7. Judging whether an observation statement is reliable - Is it accurate?
8. Judging whether an inductive conclusion is warranted - Is it justified?
9. Judging whether the problem has been identified - Is it relevant?
10. Judging whether something is an assumption - Is it taken for granted?
11. Judging whether a definition is adequate - Is it well defined?
12. Judging whether a statement taken on authority is acceptable - Is it true?

(Fisher, R. 1990, pp. 68-69).

Kurfiss (1988), while supporting the centrality of argumentation to critical thinking, takes a different position to the pervasive skills plus dispositions construct and describes critical thinking as constituting three elements namely:

Argument skills;

cognitive processes;

Intellectual development.

Argument skills

Critical thinking for Kurfiss (1988, p.13) involves the justification of one's beliefs. Argumentation is seen as the vehicle via which justification is tendered. In this context arguments are portrayed as human interactions where a "...train of reasoning in which claims and supporting reasons are linked to establish a position." The core components and their concomitant skills are that of: analysing arguments, detecting errors or fallacies in reasoning, and constructing convincing arguments particularly those encountered in "everyday life". Kurfiss (1988) thus suggests that critical

thinking has become almost synonymous with inductive argumentation and, therefore, applied informal logic. In relation to pertinent skills, Kurfiss acknowledges the variety of proposed inventories and cites the essential skills of Facione (1984; 1986):

1. Identifying issues requiring the application of thinking skills informed by background knowledge;
2. Determining the nature of the background knowledge that is relevant to deciding the issues involved and gathering that knowledge;
3. Generating initially plausible hypotheses regarding the issues;
4. Developing procedures to test hypotheses, which procedures lead to the confirmation or disconfirmation of those hypotheses;
5. Articulating in argument form the results of these testing procedures;
6. Evaluating arguments and, where appropriate, revising the initial hypotheses in the light of alternative understandings developed during the testing process.

Cognitive Processes

Kurfiss (1988) posits that among the skills issue lies unexplored questions of how people arrive at conclusions, how knowledge influences reasoning processes, how people learn to use intradisciplinary methods to address complex issues, and how they direct and sustain attention to the intellectually demanding, multi-faceted task of thinking critically. In line with previous commentator's concerns, Kurfiss finds the logicians ever increasing lists of fallacies perplexing, since they do little to facilitate understanding as to why people persist in erroneous reasoning, even when alerted to the pitfalls of fallacious reasoning. Cognitive researchers have not successfully addressed all these questions but have illuminated many aspects of reasoning processes, in that:

Knowledge is meaningful information stored in memory;

Knowledge in memory is organised;

Knowledge takes many forms;

Knowledge must be well understood and accessible for effective problem solving;

Novices and experts differ in how they acquire and utilise knowledge in their thinking;

Critical thinking is similar but not the same as problem solving;

Metacognitive strategies enhance critical thinking;

Affective factors, such as curiosity, challenge, and fantasy can play a part in the intrinsic motivation to think critically.

Kurfiss (1988) concludes that research outcomes of this nature have potentially broad educational implications in relation to intellectual development.

Intellectual Development

The developmental perspective traces the transformations in learners' beliefs about the nature of knowledge and truth. One of the major desirable developments in students' intellectual growth is recognising the indeterminacy of knowledge and the fallacy of single truth and ultimate authority. The ultimate educational task is to enable individuals to make rational , caring commitments in a relativistic world. Kurfiss, accords with the views of Perry (1970) and Belenky et al. (1986) in proposing that it is the mature epistemology of commitment as opposed to pure relativism and isolated analytical skills which represents the essence of critical thinking.

In sum it would appear that Kurfiss' (1988) conception of the constituents of critical thinking are:

The cognitive skills concomitant with argument construction and analysis;

The acquisition, organisation, retrieval, utilisation and transfer of appropriate knowledge;

The development of intellectual dexterity which enables people to commit themselves to a contextually relevant position.

Siegel (1988, p.23; 1991), whilst concurring with the general skills plus dispositions view, further differentiates the dispositional constituents of critical thinking. He postulates that the construct comprises the two fundamental components of reason assessment and critical spirit. In relation to the former, Siegel contends that the critical thinking individual is one who is "appropriately moved by reasons." This focus on rationality involves: an appreciation of the power of reasons to warrant or justify beliefs, claims, and actions; and an ability to properly assess the force of reasons in contextually sensitive ways, for example, by applying the skills and criteria required in establishing inductive or deductive validity or statistical significance. This component essentially advocates not only the application of cognitive and mathematical skills but also the issue of contextual skills.

The critical spirit component, however, involves a complex of dispositions, attitudes, habits of mind, and character traits in the form of:

Dispositions

A willingness, desire, and disposition to base one's actions and beliefs on reasons;

The disposition to seek reasons and evidence when making judgements;

The disposition to evaluate reasons carefully in accordance with relevant principles of reason assessment;

Attitudes

A respect for the importance of reasoned judgement, and truth;

Rejection of partiality, arbitrariness, special pleading, wishful thinking and other obstacles to proper reason assessment

Habits of mind

Reason seeking;

Evaluating;

Engaging in due consideration of the principles of reason assessment;

Subjecting proffered reasons to critical scrutiny;

Engaging in fairminded and non-self interested examination of reasons.

Character traits

Refer to a person's macro-disposition to:

Pay attention to reasons;

Regard reasons as important;

Act upon reasons;

Value critical thinking, truth, intellectual honesty, and evidence.

Kneedler (1985) offers a further tripartite conception in which he cites twelve essential critical thinking skills arranged within three categories developed by the California History-Social Science Assessment Advisory Committee (1981). These comprise:

<u>Defining and clarifying the problem</u>

1. Identify central issues or problems;

2. Compare similarities and differences;

3. Determine which information is relevant;

4. Formulate appropriate questions;

<u>Judging information related to the problem</u>

5. Distinguish among fact, opinion, and reasoned judgement;

6. Check consistency;

7. Identify unstated assumptions;

8. Recognise stereotypes and clichés;

9. Recognise bias, emotional factors, propaganda, and semantic slanting;

10. Recognise different value orientations and ideologies;

<u>Solving problems/ Drawing conclusions</u>

11. Recognise the adequacy of data;

12. Predict probable consequences.

Kneedler (1985) clearly links these essential skills with problem solving which is enhanced by further attitudinal and action components. A critical attitude enables people to maintain an objective, constructive, and questioning stance towards all information received, thus avoiding biased perspectives. Critical thinking action means the individual operationalises their critical thinking skills and attitude into voting, examining issues, communicating without jargon, offering opinions, valuing the viewpoints of others, and implies a consistent transfer of critical thinking into everyday practice.

Watson & Glaser (1991, p.1), in keeping with their definition of critical thinking presented earlier, identify five aspects or abilities which they claim to be "... most significant and fundamental to the concepts of critical thinking. " These are:

Inference - the ability to evaluate the validity of inferences drawn from certain observed or supposed facts.

Recognition of Assumptions - the ability to identify presuppositions or unstated assumptions taken for granted in assertive statements.

Deduction - the ability to determine whether certain conclusions necessarily follow from information given in statements or premises.

Interpretation - The ability to weigh evidence and decide if generalisations or conclusions based on given data are warranted.

Evaluation of Arguments - the ability to distinguish between arguments that are strong and relevant and those that are weak or irrelevant to a particular question at issue.

In addition to the above abilities Watson & Glaser (1991) include an attitudinal component which includes a tendency towards enquiry and valuing of evidence in support of knowledge claims. The authors have produced a test founded upon these components which apparently tests the application of such abilities and attitudes. This will be reviewed later, in greater depth, in the methods section.

Walters (1986) sees critical thinking as constituting far more than the reductionist analysis of arguments and the repertoire of micro-skills often associated with this perception of critical thinking. He reveals four common characteristics predicated for critical thinking:

1. Critical thinking is a method of problem solving. It helps the student to identify, clarify, evaluate, and answer perplexities that arise in reading, discussion and so forth.

2. The proper method for problem solving is analysis. Breaking down beliefs or opinions into their constitutive propositions, and then further reducing those propositions to verifiable justifications, is the only way to solve the problem or problems embedded in beliefs.

3. Beliefs or opinions that are not amenable to this model of analytical reductionism are questionable - that is, they are examples neither of critical reflection nor of bona fide problems.

4. Skill in critical thinking results in an increase of power on the part of the subject. Control of one's thinking presumably results in both increased ability to concentrate and in an argumentative edge in adversarial settings.

In respect of the methodology of critical thinking Walters cites Facione's (1984) analytical process as an common example of how the critical thinker should evaluate putative arguments by:

Identifying the purported conclusion;

Identifying the purported premises;

Identifying the purported assumptions, or understood premises;

Identifying and excluding any extraneous material;

Rephrasing the argument's content for the purpose of clarification and verification.

Walters (1986) contends, however, that an overemphasis on such systematic programmes of critical thinking results in several undesirable consequences. First,

students are encouraged to assume that critical thinking methodology is the sole approach to understanding claims regarding the nature of reality. Subsequently, interpretations or expressions that fail to conform to this method as in the case of aesthetic, imaginative or metaphysical claims, are perceived as unworthy of serious consideration. Secondly, students are encouraged to make particular universal; but albeit dubious assumptions about the nature of reality and knowledge. Finally, psychologically speaking it may breed a degree of passivity in thinking as a result of the diminution of the creative speculative faculty, which in turn may engender an attitude of intolerance. It would appear thus, that while Walters recognises the logical and analytical skills constituting some elements of critical thinking, these should not be considered absolute in that abilities in evaluating artistic, abstract concepts and a tolerance of ambiguity are also legitimate. Moreover, Walters (1990) cautions that critical thinking as a conceptual model may be acquiring a 'universally applicable' and 'uncontentiously authoritative' status which is being endorsed uncritically. This tendency may be alleviated if the skills employed in a 'calculus of justification' (analytical reductionism) which enable the reasoner to logically analyse and evaluate propositions and problems, are tempered by intuitive and perceptive skills inherent in a 'pattern of discovery' which promote creative construction of alternative models, the discovery of new problems, and fresh perspectives. This prospect adds to the previous constituents, a commitment to persistent and open-minded re-evaluation. Walters (1990) also appears to be proposing that critical thinking and creative thinking are either analogous or complimentary.

Gilovich (1991), in relation to the fallibility of human reasoning and uncritical thinking in everyday life, asserts that in order to improve everyday reasoning and avoid the acquisition of questionable and erroneous beliefs, one should adopt the following habits of mind:

1. The cultivation of an appreciation of the folly of trying to draw conclusions from incomplete and unrepresentative evidence by attending to the following corollaries;

Essential corollaries

a, An awareness of how often everyday experience presents us with biased samples of information;

b, Persistence in trying to acquire elusive information;

c, An awareness of how our role, status, or social position inhibits access to certain classes of informative data;

d, consider alternatives, particularly the possibility of overlooking invisible data.

2. Try to avoid the drawbacks associated with trying to explain a vast range of outcomes in terms of our pre-existing theories and beliefs; that is, our talent for ad hoc explanations can result in quite unexpected and damaging outcomes being seen as consistent with our original convictions. Our beliefs, thus, can appear to gain too much support from equivocal evidence, which are seldom discredited by truly antagonistic results or data. Compensatory strategies in this case would be:

a, Consider the opposite, i.e. would the exact opposite outcome support my belief as well;

b, How would someone who does not believe the way I do explain this result;

c, What alternative theory could account for this outcome.

These questions may make us aware of the often tenuous link between evidence and belief, and help guard against premature acceptance of doubtful propositions.

3. An awareness of the uncertainties and distortions of second-hand information. There is always a possibility that information coming to us from others may be more remote than first appears;

4. Question whether beliefs are really as widely shared as they appear. The absence of explicit disagreement cannot be regarded as evidence of agreement;

5. An awareness of the human tendency to impute order to any complex set of stimuli, and when and where, statistical regression may likely occur;

6. Be prepared to consider the 'just chance' hypothesis and try to refrain from rushing to judgement and intervention.

Gilovich's (1991) habits of mind are thus consistent with former conceptions of critical thinking in that they advocate statistical awareness, metacognition, the value of an open mind in regard to evidence and the constant effort to consider or generate alternative perspectives.

Several attempts to construct meta - analytic taxonomies of critical thinking constituents have been made with a view to achieving some degree of consensus. Beyer (1985), for example, proposed a series of the most commonly used skills or operations associated with critical thinking. This was considered to represent a professional consensus developed from some 30 years of scholarly reflection, research and teaching experience. These include:

Distinguishing between verifiable facts and value claims;
Determining the reliability of a source;
Determining the factual accuracy of a statement;
Distinguishing relevant from irrelevant information, claims or reasons;
Detecting bias;
Identifying unstated assumptions;
Identifying ambiguous or equivocal claims or arguments;
Recognising logical inconsistencies or fallacies in a line of reasoning;
Distinguishing between warranted and unwarranted claims;
Determining the strength of an argument.

The American Philosophical Association (1990) consisting of 46 theoreticians from throughout the United States of America and Canada identified in their Delphi Research project, the following 5 core critical thinking cognitive skills:

Interpretation;

Analysis;

Inference;

Evaluation;

Explanation.

They also developed a consensus description of the desirable attributes possessed by an ideal critical thinker, thus:

> " The ideal critical thinker is habitually inquisitive, well-informed trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgements, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of the inquiry permit." (p.3).

The characteristic attributes inherent in the above description have subsequently served as the theoretical basis for what Facione, Facione & Sanchez (1994) identify as the dispositional constituents of critical thinking. These include:

Open-mindedness

Analyticity

Cognitive maturity

Truth-seeking

Systematicity

Inquisitiveness

Self-confidence.

Dick (1991), in his meta-analysis, undertook to construct a catalogue of the various processes involved in critical thinking resulting in his "taxonomy of critical thinking". Selected works by various authors spanning the previous forty years were analysed for descriptive similarities among identified processes. Dick identified what he terms 15 distinguishable types of critical thinking emerging from the literature accompanied by exemplars as follows:

Ambiguities

Ambiguity;

Definition;

Comprehension of statements - meanings;

Specificity of concepts and definitions;

Ambiguities in reasoning.

Applications

Applying facts and principles in new situations;

Generalisation;

Applying old relations to new situations.

Assumptions

Assumptions - definitional and descriptive;

Looking for assumptions;

Begging the question.

Authority

Authority is acceptable.

Emotional Language

Language usage - stated vs. suggested; emotive vs. neutral; expressive vs. dynamic.

Identifying Issues and Conclusions

Problem identification;

Recognising and defining the problem;

Recognising that a problem exists;

Identifying the nature of the problem.

Omissions

Ascertaining information needed.

Organisation

Organisation and planning of argument;

Collating and organising data;

Summarising;

Structuring problems;

Deciding process of solution;

Sequencing optimal strategy;

Inferring relations between stimulus elements;

Mapping relations between relations;

Reasoning by Analogy

Argument by analogy;

Faulty analogy;

Fallacy of analogy.

Reasoning by Deduction

Deduction.

Deductive reasoning ability

Alternative conclusions

Hypothesising

Multiple solutions.

Reasons for Conclusions

Reasons.

Sampling and Measuring

Warranted conclusions.

Statistical Reasoning

Warranted inductive conclusions

Induction.

Support of Causal Explanation

Warranted logical conclusions.

Value Conflicts and Assumptions

Decision making

Importance of consequences.

Dick further condenses the 15 types of critical thinking into five generic categories, each category comprising three types thus.

Categorisation of Types of Critical Thinking

Identifying Arguments

Issues and conclusions

Reasons

Organisation.

The components of a discourse or argument are identified. The emergent issues are then taken up and the conclusions drawn, the reasons are given for the conclusions, and organisation is used to present the narrative.

Analysing Arguments

Assumptions

Ambiguities

Omissions.

The argument is critiqued by identifying the assumptions used, the points of ambiguity and additional information needed for a convincing case.

External Sources

Values

Authority

Emotional language.

While not always required or relevant to argument analysis, value postures, appeals to authority, and strong feelings are often marshalled to influence the reader and/or listener.

Scientific Analytic Reasoning

Causality

Statistical reasoning

Sampling.

The key to scientific arguments are relating data assimilated by observation to determine cause, statistical judgement of relations, and the extent to which observations represent the broad perspective of nature that an argument attempts to embrace.

Reasoning and Logic

Analogy

Deduction

Applications.

Proofs are determined by trying to demonstrate that one argument is similar to another proven argument. Drawing specific statements which are implied by more general propositions is a basis of arguments like the proofs of geometry. More particular examples of deduction are to be found in applications of general principles to specific occasions.

Dick's (1991) work offers a useful condensation of the divergent positions pertaining to the issue of what critical thinking constitutes. It clearly illuminates once more the centrality of argumentation and the logical determination of argument validity to critical thinking. Dick, however, recognises this exercise to be a first approximation of a taxonomy of critical thinking constituents, and that the issue of contextual skills has not been examined with the same tenacity as other critical thinking processes. These processes thus need to be clarified and added as their relevance becomes apparent.

2.6 Synthesis of the Issues Arising from the Critical Thinking Literature.

A fundamental conclusion to be drawn from this significant but not exhaustive non-nursing review of what constitutes critical thinking, is that, although there is no single widely accepted definition of the construct, or of its constituents, conceptually

the phenomenon exists, at least in western cultures and is of concern to increasing numbers of people. The prevailing view appears to suggest that argument is the basic unit of critical thinking models and competent argument analysis a desired outcome. There appear to be four fundamental ingredients to critical thinking; that of a prerequisite knowledge base; a series of intellectual micro-skills; a tendency or disposition to utilise both knowledge and skills in scrutinising information or situations which comprises the stimuli for individuals to think critically and finally a series of intellectual standards to which such thinking should conform . The question of a spirit or disposition to think critically is the least contentious of the ingredients. The majority of commentators reviewed agree that a repertoire of discrete intellectual skills are of little use if they lie redundant or are used preferentially. Paul's idea of a sophistic critical thinker exemplifies the potential prospect of one-sidedness and self interest in one's disposition to think critically. Gilovich (1991) also brings into question the possible motives which stimulate such thinking. When information or evidence conflicts with an individual's beliefs, Gilovich suggests that we subject it to more precise and sustained critique than we would if the data was in keeping with our beliefs. This strategy may perpetuate until evidence is found which allows the affront to beliefs to be explained away, so leaving the individual's belief system intact, although still potentially erroneous. Having illuminated the possibilities of bias in critical thinking disposition, the precise nature of the disposition should be clarified. That is, when people find themselves in a position where they need to think critically, they need to recognise and employ a commitment to subject all data regardless of its potential to confirm or conflict with personal beliefs to equal degrees of scrutiny. The rush to early judgement or closure should be resisted in order to facilitate reasoning which is reflective of the potential complexity of issues or arguments. As difficult as this may prove to be in social, corporate, and spiritual interactions, however, thinking cannot be regarded conceptually as 'pure critical thinking' until this condition is met.

Critical thinking is, thus, generally conceived of, as a vehicle for complex reasoning which overcomes the tendency towards simplistic, egocentric or ethnocentric reasoning based upon selective or impoverished search or utilisation of knowledge and evidence, or the search for, and understanding of alternative perspectives. Informational complexity or merely being uninformed should not , therefore, be a bar to complex reasoning but be viewed as a transient deficit which can be overcome with careful committed enquiry and learning.

The following models (Fig 2.6.1) are offered to exemplify this range of reasoning derived from the literature spanning the spectrum of uncritical to critical thinking and their impact upon beliefs and action. These are intended to be taxonomic as opposed to hierarchical in nature, given the proposition that critical thinking may not be fully generalisable, in that, people may not think critically about all issues all of the time:

Spectrum of Uncritical to Critical Models of Reasoning and Their Potential Impact Upon Beliefs and Action.

Information Recipient		Interaction between information and percipient's knowledge / beliefs		Reasoning outcome
Information	Reasoner	Perceived as too complex to process.	Insufficient cognitive ability to process	Ignores information maitains status quo.
Information	Reasoner	Fits with percipient's experiential-value-belief system, according to percipient determined supporting evidence-data	No disposition to process	No change to belief. No action required.

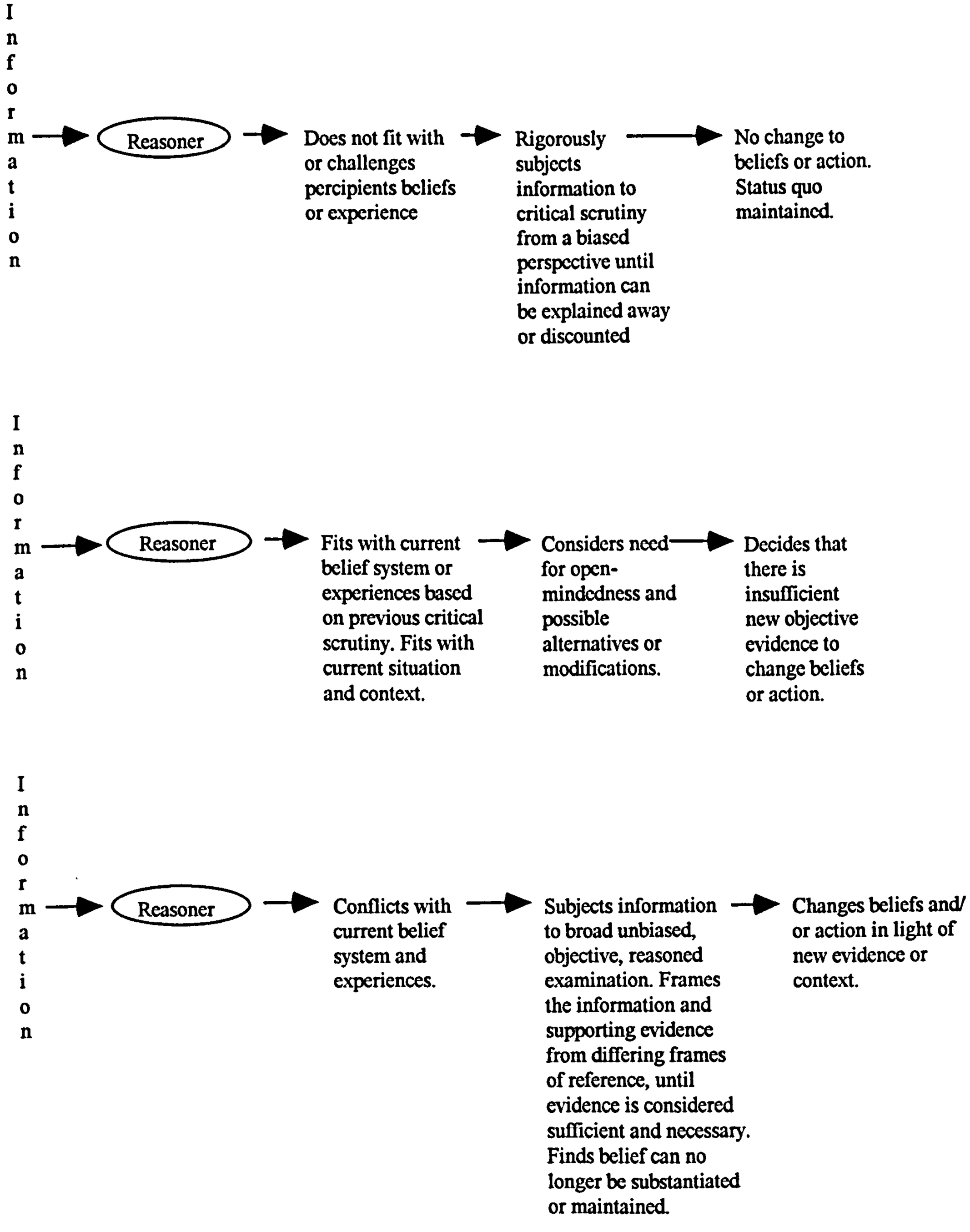


Fig. 2.6.1 Spectrum of Uncritical to Critical Models of Reasoning and Their Potential Impact Upon Beliefs and Action.

The above spectrum of reasoning encompasses deficits in cognitive skills, deficits in disposition to reason about complex issues, redundancy of critical abilities and composite application of critical abilities. With regard to the issue of redundancy one needs to clarify at this point a possible distinction between thinking and action. The fact that people do not act on the results of their critical thinking cannot be taken as evidence that such thinking has not taken place, or that individuals are incapable of such thought. Nisbett & Ross (1980) acknowledge this dichotomy between cognition and behaviour referring to the inability to bridge the gap as a failing in cognitive psychology. Similarly, Billig (1987) claims much of our thinking is in the form of personal internal arguments which may not be naturally verbalised. As alluded to previously social, familial, corporate and spiritual interactions are often fraught with power-relationships, processes of coercion and constraint. An individual's attitude to risk-taking in such environs may contribute significantly to their motivation to externalise their thinking and challenge the status quo, albeit, that they fully recognise the erroneous beliefs, unwarranted assumptions and faulty reasoning implicit in these situations or questions-at-issue, and can envision reasonable alternatives. Critical thinking in this context can uncover conflicts in systems, situations and problems, therefore, creating the conditions for challenging or argument, but not necessarily the immediate act. In respect of this issue the following are noted as potential extraneous variables:

Demographic variables

Age. Stage of growth is a prominent feature in cognitive development theories in which age is believed to correlate generally with critical thinking ability (Piaget, 1969; Watson & Glaser, 1991). Piaget correlated the emergence of critical thinking with the changes from sensorimotor to formal operational stages of development. Perry (1970) applied the stages or positions paradigm to cognitive development in the college years. He observed fundamental changes in attitude towards knowledge and authority as students progressed through the dualistic to commitment stages in

his patterns of thinking model. Alfaro - LeFevre (1995, p.21) posits that older people are more likely to demonstrate critical thinking for two reasons:

" 1. Moral development usually comes with maturity.

2. Most older people have had more opportunities to practice reasoning in different situations."

Gender. The influences of gender upon critical thinking represents a sensitive challenge in the current politically correct climate. In contrast to Perry's male oriented observations of cognitive development, Belenky, et. al. (1986) asserted that challenging authority may pose problems for learners who conceive of learning as an act of receiving. Such learners may appear incompetent in contexts that demand argumentation and disagreement. Clinchy (1989) suggests women may be more predisposed to this style of learning than men, and that as a result of this women may tend to side with arguers, searching for points of consensus as opposed to conflict.

Historical Context. It is conceivable that some sociohistorical contexts may engender the development or externalisation of criticality to a greater degree than others. The "Challenge Authority" sentiments of the late 1960s and 1970s, or the economic recessionary and monetarist reforming eras of the 1980s and 1990s are indicative of periods of social turmoil or changing perspectives which may influence individual's thinking patterns and their attitude towards voicing such thinking.

Heritage. Halonen (1995) raises the issues of racial and heritage variables in relation to critical thinking development. Cultural backgrounds it is posited may not predispose some learners to challenge authority in the classroom or in other settings. This raises important questions regarding the value placed upon general critical thinking by some cultures and, therefore, opportunities to develop and practice such thinking.

With regard to professional practice, however, overcoming potential or actual oppression or personal reticence in order to meet the requirements of the client is a crucial undertaking. To reason or care in unchallenging silence would do little service to the client or the particular profession at large.

The skills issue which on first examination appears to represent a more divergent debate regarding critical thinking constituents may in fact be more tautological than substantive, representing a form of implicit consensus. That is, although many of the skills identified are compiled and termed differently, a significant proportion appear to be consistent with the processes or procedures related to argument analysis and evaluation; the generation of alternative perspectives or theories and recognising the adequacy of information as evidence. Scriven's (1976, p.39) 7 steps model of argument analysis illustrates this similarity as indicated in table 2.6.1:

Table 2.6.1 Scriven's 7 Steps Model of Argument Analysis.

1. Clarification of Meaning (of the argument and its components)
2. Identification of conclusions (stated and unstated)
3. Portrayal of Structure
4. Formulation of (Unstated) Assumptions (the "missing premises")
5. Criticism of: (a) The premises (given and missing)

   (b) The inferences
6. Introduction of other relevant arguments
7. Overall evaluation of this argument in light of 1 through 6. (p. 39).

Missing from the literature, however, despite consistent citation, is an elaboration of appropriate contextual skills, i.e. skills required in recognition of context, contextual analysis and contextually sensitive reasoning. Although its centrality to the processes of critical clinical reasoning is presupposed, scant attention is given to its description and requisite skills. The context or set of circumstances surrounding nurse's clinical decision making can make patients' problems or needs unstable and transitory. Bowers & McCarthy (1993, p. 107) claims that: '...changing the context of a clinical problem not only alters the terrain around it, but may significantly reorder the

internal structure of the problem, substantially redefining the situation'. Context is, thus, an important aspect of clinical reasoning and individualised care. Contextual ability in relation to critical thinking in nursing is conceived as an:

> 'Ability to recognise that or when the circumstances surrounding an event make the generalisation of a claim, principle, rule, intervention or procedure inappropriate in respect of the normative or anticipated outcome of such an event.'

The number of potential circumstances to be considered when nurses make clinical decisions are legion but essential for the generation of alternative perspectives and critical evaluation of nursing outcomes. For example, nurses may ask themselves how the following circumstances would affect their clinical decisions:

- Age
- Gender
- Culture
- Religion
- Ethnicity
- Socio-economic status
- Level of development
- Physical structure and ability
- Cognitive ability
- Pathophysiology
- Boundaries of practice

In light of the discussion thus far and for the purpose of this study critical thinking is synthesised as:

Purposeful autonomous thinking which is derived from a physiologically mediated interaction between incoming information / stimuli from the external environment and an individual's knowledge base, experiential repertoire, belief systems and thinking strategies. The purpose of the interaction in the context of critical thinking,

is to evaluate the worth or truth of information by expanding peoples' thinking processes beyond a self-centred universe founded upon limited personal experiences and concrete certainties, towards a richer more diverse realm where a multiplicity of values, truths, and visionary possibilities exist (Meyers, 1986). It constitutes a series of discrete cognitive abilities, some of which are analytic and reductionist, others evaluative, a series of characteristic affective dispositions, and certain intellectual standards criteria. Theoretically, the dispositions act as the vehicles which in turn activate the utilisation of the cognitive skills in reasoning which conforms to the intellectual standards. The dimensions of these aspects are now offered as follows:

Cognitive Skills

Selective attention - the ability to initiate and maintain a sustained focus on an issue or situation in the face of competing stimuli, and irrespective of degree of personal interest;

Interpretation - clarification of meaning

Analysis - deconstruction of existing knowledge, theories , claims, in order to establish constituents and relationships. identification of context.

Inference - drawing of warranted conclusions derived from relevant informational relationships

Generation of alternative theories / perspectives - even when in conflict with own

Evaluation - judging the validity and sufficiency of evidence, arguments, claims via establishment of appropriate criteria

Metacognition - ability to consistently monitor and modify one's reasoning performance. Ability to recognise emotional attachment to certain premises, beliefs and conclusions.

Dispositions

The following dispositions represent a combination of essential individual tendencies derived from the literature which are conceived as instrumental in motivating individuals in initiating, conducting and sustaining their critical reasoning behaviours:

Scepticism - resisting the indiscriminate acceptance of evidence and claims.

Inquisitiveness - a desire to pursue problematic issues to reasoned conclusions irrespective of apparent complexities and personal investment demands.

Tolerance of Ambiguity - an appreciation of the possibility of inconclusive outcomes in relation to contextual or time relevant decisions and action.

Resisting early closure - recognising the sufficiency of evidence and overcoming tendencies towards simplistic, single structure reasoning.

Desire to search for independent evidence - non - reliance on proffered evidence.

Open-mindedness - an appreciation of alternative perspectives, ways of knowing, and methods.

Flexibility - subjecting beliefs to scrutiny and change.

Intellectual courage - understands limitations to personal knowledge and able to admit this to others.

Self - Confidence - Doubting personal reasoning abilities and being preoccupied with the prospect of failure or challenge can impede critical thinking.

If the above skills and dispositions are seen as the means underpinning critical thinking, then performance in such processes must be contingent upon some desired end. For example, how should we know, even when people appear to use the means of such reasoning, that the reasoning is effective, of value and above all critical? The answer would appear to be some defined intellectual standards by which performance can be evaluated against. The following intellectual standards developed by Paul (1991) are adopted for the above purpose (Table 2.6.2):

Table 2.6.2 Paul's (1991, p.288) Intellectual Standards Reflecting the Perfections and Imperfections of Thought.

Clarity	vs	Unclarity
Precision	vs	Imprecision
Specificity	vs	Vagueness
Accuracy	vs	Inaccuracy
Relevance	vs	Irrelevance
Consistency	vs	Inconsistency
Logicalness	vs	illogicalness
Depth	vs	Superficiality
Completeness	vs	Incompleteness
Significance	vs	Triviality
Fairness	vs	Bias or one-sidedness
Adequacy (for purpose)	vs	inadequacy

Because of the overall evaluative nature of critical thinking, it is seen as predominantly reactive. That is, the reasoner has to be first confronted with data in some form, and receive it into sensory stores, before one can analyse and evaluate them. In this sense critical thinking differs conceptually from creative thinking, in that one can be creative or generative from a blank sheet of paper initially, whereas one cannot be critical from such a blank sheet. Critical and creative thinking may thus interact cyclically (Fig, 2.6.2) whereby when problems are identified in claims or arguments the reasoner generates an alternative explanation or perspective, which is in turn evaluated critically.

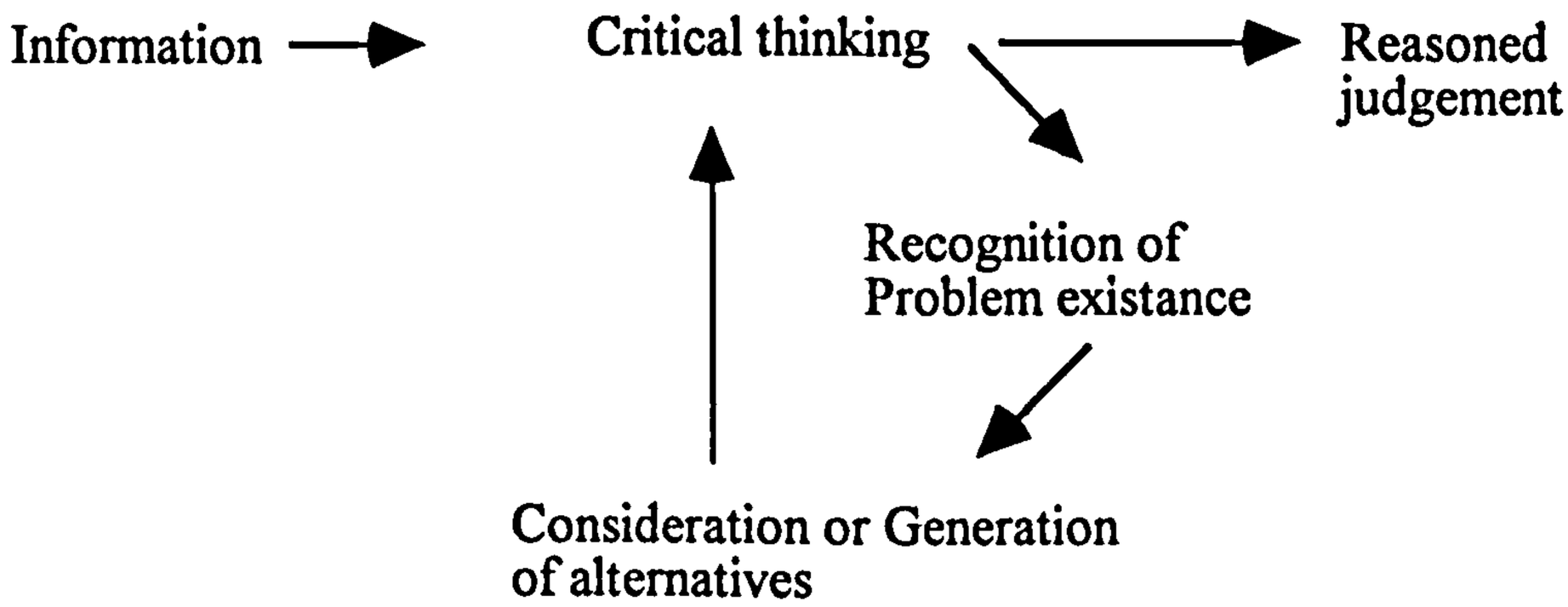


Fig. 2.6.2 Cycle of Critical Reasoning.

A crucial stage in the above cycle and in the critical thinking process is thus the generation of alternatives. For, in the absence of the generation of alternatives, the critical process is terminated resulting in the acceptance or construction of a one-sided argument.

Moreover, critical thinking in the context of this study is not accepted as completely synonymous with problem solving. Critical thinking may not necessarily conclude with solutions to problems, but instead, a greater understanding of the problem itself and a need to tolerate ambiguity (Landis & Michael, 1981).

The overall outcome of the interaction and utilisation of the skills, dispositions and intellectual standards is purposeful, autonomous thinking which enables an individual to:

Determine the authenticity, accuracy, consistency, objectivity and worth of information, arguments and knowledge claims (Beyer, 1985), by avoiding the indiscriminate acceptance of one-sided (face value) arguments, and avoiding

the indiscriminate construction and defence of one-sided arguments (Daly 1998).

Argument in the above sense is defined as:

> What the proponent of a position offers an audience, a questioner or a doubter as reasons or basis for acceptance of the claim in question. That is, a more or less complex set of premises supporting a conclusion (Blair, 1988).

In light of espoused relationship between logic and the processes of argumentation pervading the critical thinking literature, the next section will review the role of logic in critical thinking. The review will serve the dual purpose of differentiating between types of logic and associated arguments, and for providing the theoretical background in deciding which logical approach best suits the methodological demands of the research questions.

2.7 The Role of Logic in Critical Thinking.

In the previous section several commentators characterised critical thinking as being equivalent to thinking that is logical. McPeck (1981) raises the question as to what extent can logic be a surrogate for critical thinking? This raises the further question as to which branch of logic should critical thinking best be allied to, that of formal or informal logic? The literature pertaining to the distinctions between both forms of logic is voluminous and beyond the scope of this study. For the sake of brevity the commonly accepted distinctions will be addressed as a means of elucidating later methodological considerations. Given the common practice of using the terms logic, reasoning and correct reasoning synonomously (Scriven, 1976; Galotti, 1989; Salmon, 1991) the term 'reasoning' will be adopted here for the purposes of clarity.

<u>Formal Reasoning</u>

Bartlett (1958) categorised formal reasoning as closed-system thinking in which all terms are defined in advance. Galotti (1989) conceives of formal reasoning as

including all problems of logic, i.e. propositional, predicate, modal and others. She also concurs that in formal reasoning all information is furnished in advance. Salmon (1991, p.154) posits that formal reasoning is so called because of its focus on the "...structural or formal relations in arguments, such as class inclusion, class exclusion, conjunction, negation and implication." The canons of formal reasoning demand that whilst focusing on such relations, specific content or subject matter is ignored and to facilitate this many logicians expressed the rules of logic in an abstract symbology (Nickerson, 1991). Thus, arguments often couched in the form of Aristotelian categorical syllogisms consisting of three terms, are adjudged valid or invalid by virtue of whether a conclusion correctly follows from premises according to a set of defined procedures. These procedures are known as deductive systems which rest upon the fundamental cognitive act of inference . An argument can be deductively valid if a true conclusion follows from premises that are true. Conversely, an argument may also be valid when a conclusion logically follows from premises that are untrue. An argument is deductively invalid if true premises lead to a false conclusion. One of the fundamental problems with this form of reasoning is establishing beyond doubt the truth of the premises given potentially disparate meanings and interpretations. The primary focus then, is one of form or syntax as opposed to content or semantics. Issues of meaning in formal reasoning, however, cannot be entirely avoided for the terms *and* and *or* possess considerably more precision than in their meaning in everyday speech. It is also necessary to understand the content of what is asserted in order to see that an argument is invalid as defined. Galotti (1989) refers to an association between formal reasoning, laboratory studies and well defined problems. Govier (1988) believes training in formal logic confers important benefits for individuals, particularly in habits of rigor, justification and clarity which ideally will be transferred to reasoning outside of the laboratory or classroom. Another benefit is the inculcation of what a logically ordered valid argument will look and feel like.Experience in this aspect of formal reasoning can make fuzzy or non-compelling arguments more apparent. This contrasts with Salmon

(1991, p.158) who claims that recent psychological studies suggest that formal instruction:

"...is strikingly ineffective; the skills allegedly taught do not transfer to situations outside the classroom." Students also see little relevance between the type of arguments dealt with in formal logic classes and those confronted in real life, or that examples are so simplistic, that they hardly warrant utilising the procedures required to evaluate them.

Informal reasoning

By contrast, informal reasoning is concerned with what is called everyday or inductive reasoning, where arguments are not couched in syllogistic forms but often comprise more than three terms, and more than two premises . Although recognising structural aspects of arguments informal reasoning does not rely on these, or deduction, to form the exclusive basis for evaluation. Content is not abstracted from the argument, but content and context are both taken into account in the conduct of its principles. The deductive arguments encountered in everyday life are rarely expressed in canonical form. They are often incomplete, requiring the addition of missing elements by means of searching, and the disentanglement of irrelevancies. Once this tidying up exercise has been completed, there still remains the problem of whether or not to believe the premises. For in many real life reasoning instances it is difficult to accept or reject premises with complete certainty. Nickerson (1987) cautions that although informal reasoning is not constrained by precise formalisms as in syllogistic reasoning, it is not absolutely devoid of form either, citing the following modes or forms concomitant with informal reasoning:

induction;

analogical reasoning;

disputative argument;

dialectical reasoning.

These forms themselves are less precise and less understood than those of formal deductive reasoning. Furthermore, they do not provide a systematic means of evaluating arguments. Evaluating complex informal arguments can be extremely difficult. People of considerable intellect, good will and open-mindedness, after struggling to consider and understand all sides of a controversial issue often arrive at differing conclusions. In addition, two people holding initially conflicting views given the task of examining the same evidence, often find reasons for strengthening those existing views (Nickerson, 1987). Such tenacity may be explained by differing perspectives in the use of evidence. The same evidence can appear very different due to the distinct background knowledge individuals bring to its interpretation.

Blair (1988) claims that despite disagreements between informal logic teachers as to grounds for evaluating the cogency of informal arguments a consensus does exist, and incorporates three approaches thus:

1. <u>The Soundness Paradigm</u>

This approach holds that a cogent argument is one with true premises and either valid deductive implications or strong inductive implications. These are assessed by establishing the truth of claims in the form of premises portrayed in the argument, and by recognising typical invalid patterns of inference. Examples of such invalid patterns are denying the antecedent (if a premise is false then anything it implies is false) or weak inductive reasoning such as generalising from an unrepresentative sample. Weaknesses in this approach rest again on whether the truth of premises is necessary for adequacy or sufficient for acceptance given the problems of establishing truth with certainty, e.g. generalising from an unrepresentative sample although based on insufficient grounds may nonetheless turn out to be true.

2. The Fallacies Approach

This approach advocates that people are best equipped to avoid faulty reasoning by learning to recognise a series of common fallacies. These are predominantly informal fallacies such as:

Abusive ad hominem - attacking the proposer instead of the argument substance.

Appeal to force - where threats are used as a basis for accepting conclusions.

Begging the question - assuming in the premises the very thing to be proved.

Hasty generalisation - making universal claims from a small sample.

Straw man - constructing a weak form of the opponent's argument then knocking it down.

Post hoc ergo propter hoc - because B follows A, B was caused by A.

Armed with knowledge of the above people are thought to be empowered to evaluate the cogency and authenticity of claims and arguments.

3. The Critical Vocabulary

This approach is underpinned by the existence of a critical vocabulary within everyday language (Blair, 1988) and affords us a set of adequate concepts with which to appraise arguments. Students have but to learn this vocabulary and apply it with discrimination as a means of improving their critical skills and judgement. The vocabulary consists of terms such as:

Vagueness	Ambiguity
Inconsistency	Insufficiency
Irrelevance	Bias
Prejudice	Imprecision
Problematic	Stereotype
Cliché	Euphemism

Blair's (1988) Critical Vocabulary

These are further assisted by Blair's (1988) language classifications which facilitate criticism these include:

Analogy	Description
Cause	Counterexample
Stipulation	Explanation
Authority	Correlation
Necessary and sufficient condition	Imply

These approaches are not mutually exclusive and may involve both inductive and deductive processes. In addition to the inferential abilities of formal reasoning, informal reasoning draws on a host of other cognitive abilities and requires judgement as follows:

judgements of relevance;

judgements of plausibility;

judgements of value;

judgements of probability.

In summary, informal reasoning appears to approximate more closely the thinking reflective of the intellectual demands faced in our everyday or professional lives where problems are unstable, multi-faceted, ill - structured and content / context dependent, as opposed to the well - structured and content / context independent focus of formal reasoning. Table 2.7.1 summarises the primary differences:

Table 2.7.1 Summary of Primary Differences Between Formal and Informal

Reasoning

Formal	Informal
All premises are supplied.	Some premises are implicit, some are not supplied at all
Problems are self contained.	Problems are not self containcd.
Formal arguments may have a long chain structure constituting many individual steps, each leading to the next.	Informal arguments may have a fork - like structure, i.e. several short lincs of argument, each with degrees of uncertainty but which converge on the conclusion.
There is typically one correct answer.	There are typically several possible answers that vary qualitatively.
Argues for only one side of a case, because their logical validity ensures that a contrary argument on another side would be invalid.	Typically includes both sides of a case, i.e. pro and con because both types of argument can usually be made.
Established methods of inference applicable to the problem often exist.	There are rarely established procedures for solving the problem in existence.
It is typically unambiguous when the problem is solved	It is often unclear whether the current best solution is good enough.
The content of the problem is often of limited academic interest.	The content of the problem typically has potential personal relevance
Problems are solved for their own sake.	Problems are often solvcd as a means of achieving other goals
Typically does not require the overcoming of emotional attachments to premises or certain conclusions.	May involve the overcoming of emotional attachments to premises or certain conclusions.

After: Galotti, 1989, p. 335; Perkins, 1986, pp. 196-197.

Research on Everyday Reasoning

Research on people's naturalistic reasoning outside of the laboratory is by no means extensive, and has concentrated predominantly upon two aspects of such reasoning. That of people's performances in relation to arguing for and against general propositions which has only indirect links to action, and how people solve practical problems in real life (Garnham & Oakhill, 1994). The paucity of empirical work on this type of reasoning has been attributed to the absence of a well - defined methodology and the potential overwhelming pragmatic issues confronting such studies. For example, experimenters cannot be sure how subjects will interpret a problem, or how relevant information from long term memory is brought to bear on current problems. Subjects may apply their knowledge base and personal biases in an uncontrolled manner. Additionally, there are seldom singularly correct answers to everyday reasoning problems, so standardised techniques for evaluating performance

in the form of problems correctly solved are not applicable (Galotti, 1989; Garham & Oakhill, 1994).

Some tentative conclusions in respect of informal reasoning are, however, apparent. Wagner & Sternberg (1986) and Fredericksen (1986) claim that the breadth and depth of knowledge base is central to the prediction of informal reasoning quality. Perkins et al. (1983) point to the more process oriented aspect of thorough and unbiased search for evidence and arguments as essential for sound reasoning. Ceci & Liker (1986) argue that effective informal reasoning depends upon a more or less sophisticated integration of information. With regard to the possible shortcomings of informal reasoning Perkins et al. (1991) found peoples' everyday reasoning to be typically incomplete and biased. Kuhn (1991) provides similar evidence of incompleteness and error in everyday reasoning which is surprisingly not improved by domain expertise.

In relation to the role of logic in critical thinking and this study, although formal reasoning does demand substantial intellectual effort in the evaluation of formalised arguments, this is only in so far as determining that arguments conform to the inferential templates of the relevant system. Difficult as this may prove for many, there are no dubious principles or issues of contention within formal systems and, therefore, little impetus to consider alternative theories or perspectives. Contention arises only when one tries to interpret or apply such issues across contexts (Govier, 1988). Informal reasoning on the other hand places differing intellectual demands on the reasoner beyond concentration on inferential strength alone. Alternative dimensions such as the acceptability of premises of the argument, the clarity of language in which it is expressed, the purpose of intent within the context it appears in and the audience to whom it is addressed, demand of the reasoner the repertoire of critical thinking skills and dispositions referred to earlier in the constituent discussion.

There appears little evidence that critical thinking ability has been examined as a distinct aspect of everyday or informal reasoning. With regard to the focus of this study critical thinking and the two aspects of informal reasoning research previously referred to were pertinent to early design issues. That is, how to explore and describe critical thinking performance in the judging of a general proposition which would bear upon practical professional decision making.

With regard to the well - structured or ill - structured distinction relating to problem nature, critical thinking in the informal reasoning context, better represents the nature of professional judgement and reasoning problems facing nurse practitioners and nursing students in their everyday practice. Few of the vexed questions or issues faced by nurses have single correct solutions given the holistic individuality of patients and their healthcare contexts, the constraints of organisations, resources, and boundaries of professional practice alluded to in chapter one. The desired outcome of such reasoning would be that of the best contemporaneous solution in context derived from practitioners' critical thinking abilities and dispositions. For these reasons, the formal reasoning approach was rejected in favour of an informal reasoning approach in design and methodological decision making.

2.8 Critical Thinking and Nursing

The notion of critical thinking in relation to nursing has only recently begun to receive selective attention. The reasons behind the emerging interest in this construct appear to be threefold:

1. Healthcare and informational changes;
2. Epistemological changes in nursing ideology;
3. Organisational and cultural changes in nurse education.

Recent concerns as to the ability of nursing practitioners to keep pace with diverse rapidly changing developments and desired outcomes in healthcare have led to calls for the concentration upon developing practitioner's thinking skills. Implicit in these concerns are not only that the volume of healthcare knowledge is increasing relentlessly to the point where reliance on pure acquisition is nigh on impossible, but also that nurses' clinical reasoning and outcome evaluation should keep abreast of current knowledge. This also implies that the scope of nurse's clinical reasoning requires a degree of complexity and accountability not previously expected.

Secondly, the evolving paradigm shift in nursing away from positivistic, curative, task oriented, linear, objective, detached, rule driven reasoning towards unbiased, holistic, autonomous clinical reasoning, reflecting non-detached consideration of individualised physical, cognitive, contextual and affective variables is testament to the changed perceptions of nursings' cognitive demands in relation to its professional practice (Glen, 1995; Baker, 1996; Hendricks - Thomas & Patterson 1995). Sound nursing judgement, thus, requires that the nurse reasons in a manner which utilises appropriate generic nursing knowledge contextually adjusted to match clients' unique cases (Paul & Heaslip, 1995). Moreover, there appears to be a move to attach greater value to thinking skills at the expense of practical skills in nursing. Kataoka-Yahiro & Saylor (1994, p.351) extol such values by asserting that:

> " Increasingly, the characteristic that distinguishes a professional nurse is cognitive rather than psychomotor ability."

This trend may be further reflected in the development in newer grades of nursing assistants and the devolution of increasing areas of practical or psychomotor functions to such grades.

Finally, over recent years nurse education in the UK has, as a matter of policy been systematically integrated into institutions of higher education with the academic status of its courses being raised to a minimum of diploma level. In concert with this

wholesale integration various social and political forces have underpinned current demands for higher education and, therefore, nursing to demonstrate the effectiveness and quality of educational programmes. One such distinguishing qualitative indicator of higher education, in which there exists general agreement is that of critical thinking and the intellectual maturity which it confers (Glen, 1995). Girot (1995) posits that it is independent critical thinking which delineates non - graduates from graduates. These distinctions and expectations, however, are problematic for the majority of UK pre registration education programmes, in that three year higher education programmes culminate in diplomate status, whilst advocating critical thinking as an intended educational outcome. UK nursing education is not distinct from its international partners in its aspirations to inculcate critical thinking abilities in its consumers. American institutions, however, have taken the additional step of making critical thinking and its assessment a compulsory component of course validation criteria (National League for Nursing, 1991). This may be instrumental in the preponderance of American theoretical and empirical literature pertaining to critical thinking in nursing. The next section will review the theoretical and empirical literature on critical thinking specific to nursing.

Part Two

2.8.1 Theoretical Nursing literature.

The main theoretical perspectives pertaining to critical thinking in nursing have focused upon either: the relationship of the nursing process to critical thinking; why nursing requires critical thinking; the construction of nursing oriented models of critical thinking and educational issues.

The Nursing Process

Nurses first began to adopt a problem solving approach in the guise of the nursing process over three decades ago. It is conceived of generally, as a variation of

scientific reasoning which is used by nurses to organise, systematise and conceptualise their practice. The question at issue in this context is whether problem solving and critical thinking in relation to nursing practice are synonymous. On the one hand problem solving begins with a problem and ends as the term suggests with a solution. On the other hand critical thinking and nursing judgement may well start with a problem but not necessarily conclude with a solution, but merely ongoing problematic situations, contextually supportive contingencies, a tolerance of ambiguity or extraneous problem resolution, i. e. remission or death. In light of these issues and discussions raised in the general literature review, problem solving and critical thinking may well be interrelated in some instances but in the case of nursing not generally synonymous.

The process emerged from the United States of America amid a growing consensus that generally nursing required a more logical, precise, disciplined and independent approach to its practice than that of its forbears. Nurses started to view their role as other than a delegated reactive medical function directed towards a curative endpoint. Instead, nurses considered parts of their function as being entirely independent of that of the doctors, particularly in instances where a curative philosophy was not optional.

Kratz (1979) describes the nursing process as initially focusing on problem solving as a means to care delivery, which proposed close nurse patient interaction, and comprised a series of four steps as follows:

Assessment - Determining patients need for nursing care. This is, identifying problems that can be alleviated by the nurse. Such problems may be of a physical, psychological or social nature.

Planning - Planning nursing care by means of setting goals which would facilitate solutions to the problems identified in the preceding step.

Intervention- Conduct of nursing care devised to meet patients problem solving

needs. Involves therapeutic interaction between patient and nurse by way of listening, teaching, motivating, as well as aspect of technical procedural competence, i.e. observation, giving of injections, management of drains, infusions and monitoring equipment.

Evaluation - Judging the effectiveness of the care as planned in its achievement of the predetermined goals, Involving the construction of appropriate criteria.

Kratz also posits that despite its apparent linear characteristics the nursing process should be continuous and recursive, this is a point of contention for many of the critics of the nursing process as alluded to previously.

More recent conceptions of the nursing process adopt the position that the process should be more improvement oriented than problem oriented, more detailed guidelines of the steps be provided, and the additional step of diagnosis be included Alfaro-LeFevre (1995, p.44) provides such an example:

Assessment - Continuous, deliberate data collection designed to provide the information required to predict, detect, prevent, control, or eliminate health problems. Identify ways of helping people obtain optimum wellness and independence.

Diagnosis - The process of analysing data, putting related information together drawing conclusions, and identifying actual and potential health problems, underlying causes of the health problems, resources and strengths, health states that could be improved.

Planning - Determination of specific goals (desired outcomes) and interventions. The interventions are designed to achieve the desired outcomes in a timely fashion, detect and prevent new health problems, promote optimum wellness and independence.

Implementation - Putting the plan into action by assessing readiness to act, acting, then reassessing to determine initial responses, making immediate changes as needed, keeping records to monitor progress.

Evaluation - Determining whether the expected outcomes have been met by comparing the patient's current assessment data with the outcomes recorded during planning, modifying or terminating the plan as appropriate, planning for ongoing continuous assessment and improvement.

On balance there appears little difference from the former model albeit that diagnosis is seen as a distinct step that presumably was subsumed in the assessment step and termed patient / client need in the earlier conception. One discrete difference, however, is that the nursing process has more recently been espoused as a tool for critical thinking in nursing (Bandman & Bandman, 1988; Alfaro-LeFevre, 1995).

Bandman & Bandman (1988) assert that strengthening the critical thinking skills of nurses increases the effectiveness of the nursing process, thus, enabling nurses to examine the basic assumptions of their theory and practice, examine systematically policies of personnel, resource and financial allocation, thereby facilitating improved decision making. They see argument evaluation as central to critical thinking in that it comprises deductive (formal), inductive, informal or everyday practical reasoning involving the analysis of language use; formulation of problems; clarification and explication of assumptions; weighing of evidence; evaluation of conclusions; discrimination between good and bad arguments and seeking to justify facts and values that result in credible beliefs and actions.

Such elements apply to professional nursing as a whole, but particularly to the inferences made during the phases of the nursing process. Inference is seen as integral to the hypotheticodeductive phases of assessment and nursing diagnosis entailing the acquisition of data, and the generation of hypotheses which are

confirmed or refuted by additional data until an appropriate diagnosis is reached. Critical thinking is applied during these phases respectively by asking fundamental questions regarding the source, validity, and uses of acquired data. Secondly, by scrutinising the nature and validity of inferential processes as a source of accurate diagnosis. Bandman & Bandman (1988) point to the perspective dependent complexity of nursing inferences, the prospective impact of insufficient available data upon inferential processes, the difficulties of linking outer criteria to inner processes, and the danger of drawing stereotypical inferences in relation to individuals. In this sense, diagnosing is a matter of trial and error and has the potential to be faulty. Critical thinking is, thus, further required to avoid overconfidence in the success of the means - ends relationships integral to the nursing process. Many proponents of the process imply that utilisation assures solutions, successes and achievements. Bandman & Bandman (1988) assert that such undue faith regards the method as deductive, whereas diagnosis as a process is largely inductive and uncertain.

With regard to the planning, implementation and evaluation stages they claim critical thinking enables practitioners to set appropriate individually attainable goals, devise and implement systematic, scientifically based care plans and evaluate the effectiveness of the preceding stages using self - corrective feedback in conjunction with appropriate methods of verification. The nursing process in concert with nurse's knowledge bases and critical thinking abilities, thus, lends itself to the systematic application of scientific theories, theoretical frameworks, and conceptual models in diagnosing and treating human responses to potential and actual health problems.

Alfaro - LeFevre (1995) claims that just as problem - solving provides a basis for disciplined thinking in everyday scenarios, the nursing process provides a similar basis for critical thinking in nursing. She makes the distinction between a rote linear application of the nursing process in the absence of critical thinking, and the

dynamic application of the nursing process in conjunction with critical thinking (Fig. 2.8.1.1):

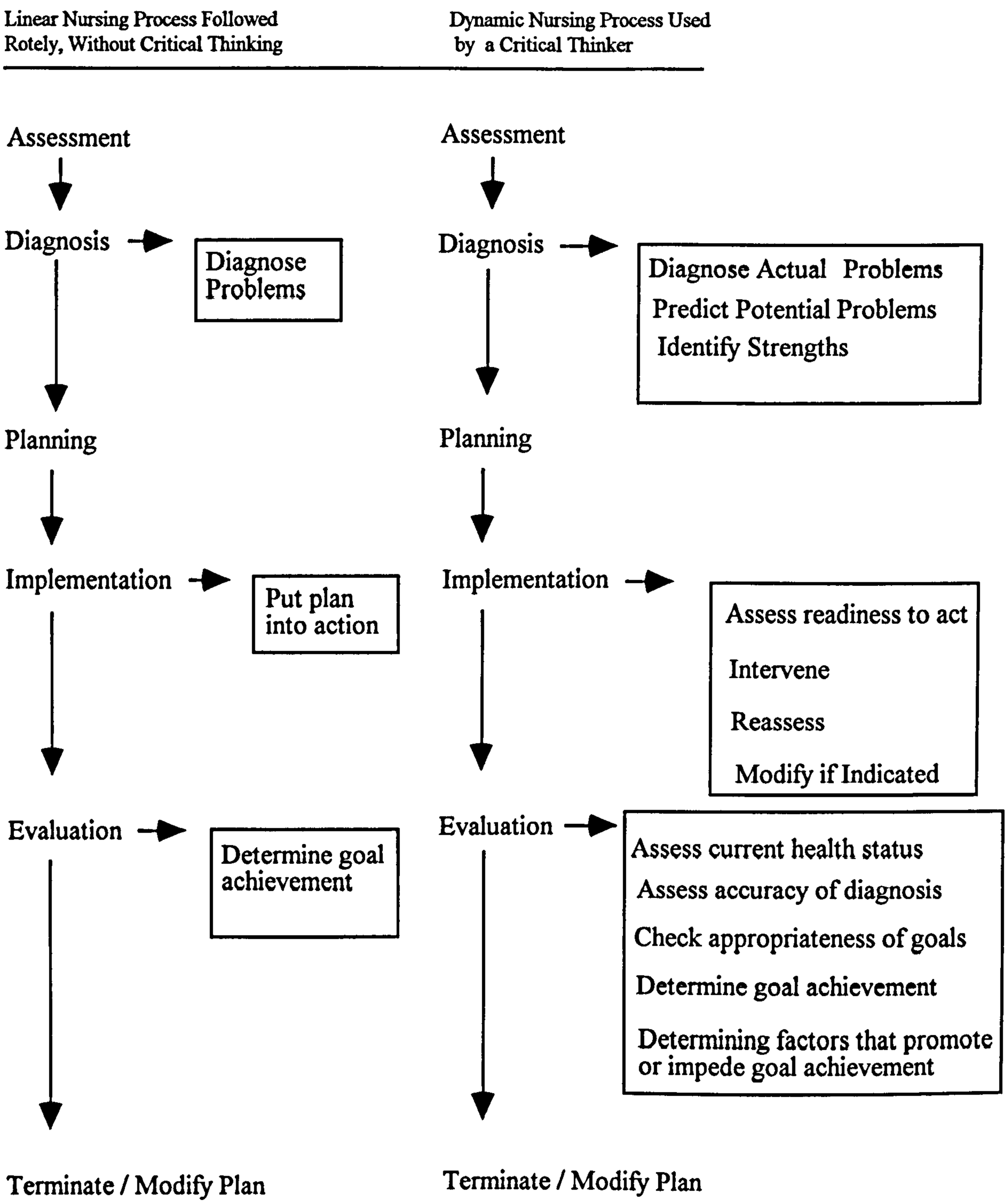


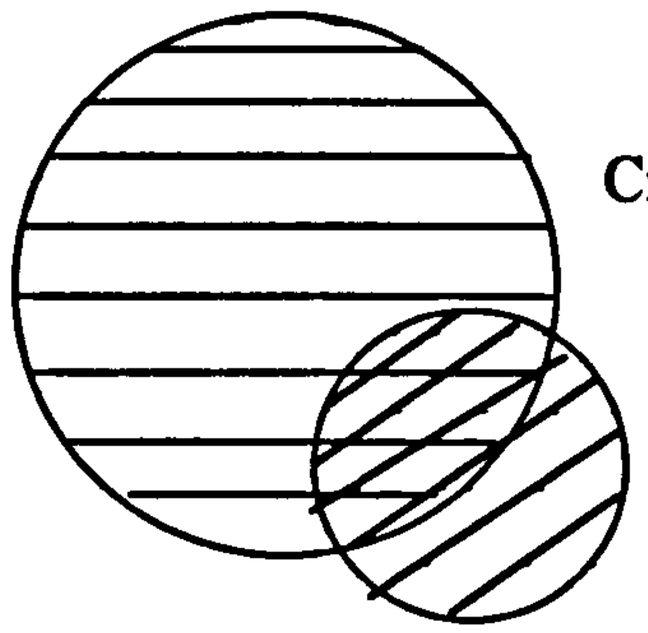
Fig. 2.8.1.1 Alfaro-LeFevre's (1995) Model of the Nursing Process With and Without the Application of Critical Thinking

The dynamic critical thinking utilisation of the nursing process is deemed distinct in that it signifies precise, and disciplined thinking reflective of greater depth and accuracy of data collection as a means of clearly identifying issues in question. In practice, however, it would be difficult to imagine practitioners applying the nursing process in such a limited way as portrayed by the rote model, that is, diagnosing problems irrespective of current actual or potential patient problems which do not take account of patients abilities or altered abilities. It is also difficult to imagine groups of nurses functioning in such a rote fashion as fail to modify a care plan if modification was indicated. It also remains unclear as to how critical thinking skills and dispositions apply to specific stages of the process thus maintaining an implicit relationship between the nursing process and critical thinking.

Wilkinson (1992, p.27) envisions a clear, albeit partial, relationship between the nursing process and critical thinking founded upon the following argument:

> "...the nursing process is a problem-solving method that involves decision making. Critical thinking is an essential part of problem solving and decision making. Therefore, it is essential to most aspects of the nursing process."

The limits to the relationship are exposed by the assertion that people use critical thinking in many situations external to the nursing process not synonymous with problem solving, e.g. assessing political and commercial claims, math problems, Figure 2.8.1.2 illustrates the nature of this relationship:



Wilkinson, (1992, p.27).

Fig. 2.8.1.2 Wilkinson's (1992) Model of the Relationship Between Critical Thinking and the Nursing Process.

The quality of solutions to complex problems, however, are dependent upon the quality of the thinking involved. Because the problems faced by nurses are often complex and multivariate, Wilkinson believes nurses must think critically to utilise the nursing process effectively, and that critical thinking applies to each stage of the nursing process thus:

Assessment - Critical thinking is required during this stage to make reliable observations based upon the ability to distinguish relevant from irrelevant information. Validating information is also important whereby the nurse validates what the patient reports against what she / he observes. Organising and categorising relevant information according to a theoretical nursing framework also requires critical thinking.

Diagnosis - Critical thinking applies to the making of nursing diagnoses in that it requires the recognition of generalised patterns and relationships and the making of sound inductive and deductive inferences.

Planning - During the planning stage nurses use professional knowledge and critical thinking skills to:

Generate valid generalisations, explanations and predictions while setting client goals.

Plan nursing interventions and provide supporting rationale by generating and considering alternative perspectives and making interdisciplinary connections utilising within and between subject insights.

Develop reasonable hypotheses regarding problem solution and interventions.

Development and application of evaluative criteria whereby the effectiveness of the generated goals are subsequently evaluated.

Implementation - Wilkinson suggests critical thinking applies during this stage in nurses' ability to apply knowledge and principles to each specific patient - care situation as opposed to purely memorising them.

A potential shortcoming in this instance is that knowledge and principles could be applied in an uncritical and ritualistic fashion. Theoretically critical thinking could apply during implementation when the nurse recognises that changes in patient condition or context does not warrant continued rote implementation of interventions without modification or transient suspension of interventions, albeit that the intervention should not be discontinued. These issues may of course be implicit in Wilkinson's use of the term "each specific patient - care situation."

Evaluation - Critical thinking applies to this stage when nurses use new patient derived observations to evaluate whether hypotheses were correct and interventions fit for purpose by using the criterion developed during the planning stage.

Jones & Brown (1993, p.72), however, question the assumption that critical thinking and the nursing process are synonymous. They see the nursing process as an:

> "... example of how nursing has promulgated a single model of practice to the exclusion of other alternatives."

This contrasts with the position that critical thinking is predicated on the intellectual disposition toward challenging accepted visions of truth and an openness to the consideration of alternative possibilities and explanations. Critical thinking is, thus, a

multidimensional cognitive process, unlike the unidimensional ways of thinking concomitant with the rules of logic, and the nursing process as an aspect of the scientific or problem solving method.

To Jones & Brown (1993), problem solving, requires that the nurse identifies the most important problem, the problem is then labelled, information is gathered to explicate the problem, a solution is then sought, the solution is then implemented, and finally the solution effectiveness is evaluated. In this sense complexity and uncertainty are reduced to procedural problems in order to conform to a methodology that seeks to generate hard data. Patient problems are, thus, solved in a scientifically objective, rational, linear, step-by-step manner where truth is absolute and the possibility of different truths rejected.

Nurse - client interactions, however, are often characterised as non-linear in that nursing practice should be directed towards the client's frame of reference. Clinical decisions should evolve from a process of negotiation often between conflicting points of view, contradictory lines of reasoning, and situational contexts. Hence a more context - driven approach to human health care befits nursings' client orientation as opposed to one driven by scientific objectivity. Critical thinking offers nursing such a perspective which is more consistent with the realities of the discipline, existing as it does in a complex social world. Jones & Brown (1993) offer a valuable example of conflicting perspectives in the management of a terminally ill patient, where a physician desires to adhere to a vigorous medical plan involving aggressive interventions. The distressed family finds itself deferring to the physician's 'expert' opinion. The experienced primary nurse, however, advocates a conservative supportive care plan in respect of their experience of the expressed and unexpressed needs of the patient. A logical case could be built to support either position, the final outcome, however, would be affected by multiple factors existing outside the framework of deductive reasoning which constitute individual perspectives, for

example, cultural beliefs, finances, value systems, age, family responsibility, family relationships, and experiences. The same decisions would not be made by all physicians, nurses or families because they too will be subject to the same factors in differing contexts.

The nursing process and critical thinking then, according to Jones & Brown (1993) are distinct in that they are predicated upon two different types of thinking processes each with its particular conception of truth and problem solution. The nursing process as a scientific method of problem solving is useful for procedural problems. Yet critical thinking is a superordinate concept which can be applied to problem solving and thus the nursing process. Applying critical thinking in this way would enable nurses to envisage the prospect of more than one right answer, thus, avoiding formula driven clinical reasoning in regard to the complex issues confronting their practice.

Miller & Malcolm (1990) criticise the nursing process on the grounds that it de-emphasises the contextual basis for nursing practice. Allen et al. (1989) suggest the nursing process merely represents an outline by which to organise information gathered elsewhere, as opposed to a process through which one makes discoveries and learns to manage such previously obtained information. Fonteyn & Flaig Cooper (1994) view the written nursing process as incongruent with the complexity and variability of contemporary nursing practice. They cite a need to de-emphasise linear, dogmatic care models in favour of more individualised models which incorporate the intuitive and scientific nature of nursing practice. Such alternatives, they claim, are more likely to foster critical thinking skills in learner nurses who also question the need to construct elaborate written process plans which bear little relevance to actual practice.

In summary the arguments are presented thus. That critical thinking is an adjunct to effective use of the nursing process. The Nursing process is a useful adjunct to critical thinking about nursing practice. The nursing process by its very nature constrains clinical reasoning.

The author's view on the debate is that despite its espoused linear characteristics, all stages of the nursing process require reasoning which may or may not be linear in its conduct. Such reasoning may also be more or less critical dependent upon the situation and the practitioner's critical thinking skills and dispositions. An important issue here is not to confuse the cognitive processes used by nurse practitioners with the nursing process, which is essentially one model of sequencing and documenting nursing care. The sequence is a feasible one which after all represent the client's transition between initial encounter within a healthcare episode through to discharge from care and a return to independence, or towards a long term healthcare relationship. Also one cannot evaluate something which has not first been identified and described. The sequence also represents the potential developmental stages of nurse - client relationships from introduction to mutual interaction in therapeutic interventions to sustained continuity or conclusion of care. Accurate recording of such episodes is a current UK professional requirement (UKCC, 1993, p.2). The UKCC view record keeping as an:

> "...essential and integral part of care and not a distraction from its provision."

Effective record keeping is thus deemed to be a means of:

> Communicating with others and describing what has been observed or done;
>
> Identifying the discrete role played by nurses, midwives and health visitors in care;
>
> Organising communication and the dissemination of information among members of the team providing care for a patient or client;
>
> Demonstrating the chronology of events, the factors observed and the response to care and treatment;

> Demonstrating the properly considered clinical decisions relating to patient care, (p. 4).

In this sense such records are viewed as potential evidence in law, or as required by nursing or medical regulatory bodies. The UKCC, thus, advocates a 'process' approach to record keeping, not only as a systematic approach to practice, but also as a means of providing a framework for the documentation and subsequent analysis of that practice.

The requirement to document care in this manner, however, need not reflect the course and nature of practitioners' thinking, albeit that some of the thinking is documented in this way. Critical thinking should thus be applied to each stage of the nursing process in order to develop individually accurate, effective and holistic care plans synthesised from the consideration of knowledge, context and alternative frames of reference. For example, in regard to the assessment stage Lutzen & Tishelman (1996) remind us of some of the critical questions to consider if one is to achieve this when formulating a nursing diagnosis:

> Is the nursing diagnosis value - free?
>
> Are patients' needs and experiences categorised independent of context?
>
> Has the formulation of the nursing diagnosis occurred in collaboration with the patient?
>
> Has the nursing diagnosis evolved from a mutually agreed nurse - client relationship?
>
> Is the reasoning underpinning the nursing diagnosis ordered and unidimensional or multidimensional in nature?

The relationship, thus, is perceived as a unidirectional one in that critical thinking can be applied to the nursing process as opposed to the converse, and the process need not constrain thinking. The nursing process is viewed as a means of the sequential conduct and documentation of care, and not as a sole means of concurrent reasoning

about care, much of which would go unrecorded. Finally, the nursing process may also serve as a useful structural or logical framework for novices to utilise as they build up their repertoire of experiences, which are purported to facilitate the more intuitive non - linear approaches to clinical judgement used by experts (Benner & Tanner, 1987; Grobe et al., 1991; Fonteyn et al., 1991; Field, 1987).

2.8.2 Why Do Nurses Need to Think Critically?

As previously identified commentators within the field unreservedly advocate the need for nurses to be critical thinkers. Many subsequently, couch their assertions in vague generalisations which imply an essential relationship between good clinical and professional practice, without specifying precisely why nurses need critical thinking skills and dispositions or how they specifically apply to nursing practice. There are, however, several who attempt to overcome this shortcoming.

Bandman & Bandman (1988) espouse the need for critical thinking in nursing on the grounds that it is of practical assistance in nursing and acts as a liberating force in thoughtful activity pertaining to nursing. Nursing has to continuously review and transform its theory, practice, social mandate and status. Such reviews, however, serve little purpose if they are conducted from a singular, monolithic, concrete perspective. Such an approach effectively eliminates doubt, questioning, inquiry, curiosity, examination and the consideration of alternatives. The former approach may maintain the status quo and ritualistic practices regardless of utility, whilst the latter facilitates more divergent clinical judgement and richer reasoning in relation to controversial issues extending beyond clinical judgement. As a means of achieving the latter they provide the following checklist (Table 2.8.2.1) of critical thinking functions in nursing:

Table 2.8.2.1 Bandman & Bandman's (1988) Checklist of Critical Thinking Functions in Nursing.

Use the processes of critical thinking in all of daily living;
Discriminate among the uses and misuses of language in nursing;
Identify and formulate nursing problems;
Analyse meanings of terms in relation to their indication, their cause, or purpose, and their significance;
Analyse arguments and issues into premises and conclusions;
Examine nursing assumptions;
Report data and clues accurately;
Make and check inferences based on data, making sure that the inferences are at least plausible;
Formulate and clarify beliefs;
Verify, corroborate, and justify claims, beliefs, conclusions, decisions, and actions;
Give relevant reasons for beliefs and conclusions;
Formulate and clarify value judgements;
Seek reasons, criteria, and principles that effectively justify value judgements;
Evaluate the soundness of conclusions, (pp. 5-6).

Alfaro - LeFevre (1995, p. 46) asserts that nurses need to be critical thinkers in order to practice sound clinical judgement. She defines clinical judgement as:

" Critical thinking in the clinical area."

Accordingly critical thinking applies to nursing in that it:

Entails purposeful, goal - directed thinking;

Aims to make judgements based on evidence (fact) rather than conjecture (guesswork);

Is based on principles of science and scientific method (e.g. maintaining a questioning attitude, following an organised approach to discovery, and making sure information is reliable);

Requires strategies that maximise human potential (e.g. tapping on individual strengths) and compensate for problems caused by human nature (e.g. the powerful influences of personal perceptions, values and beliefs).

She further posits, that nurses must develop a professional level of critical thinking ability and performance, that is different from that expected of others. Examples of when critical thinking is essential to nursing are when nurses try to:

Get a better understanding of something or someone;

Identify actual and potential problems;

Make decisions about an action plan;

Reduce risks of getting undesirable results;

Increase the likelihood of achieving beneficial results;

Find ways to improve (even when no problems exist), (p.41).

Although the above could also be said to apply to any professional discipline Alfaro - LeFevre does specify ten strategies for the development of effective clinical judgement and, therefore, by definition critical thinking in the clinical area. Adopting the following strategies purportedly promotes precise, disciplined thinking that enhances accuracy and depth of data collection in order to clearly identify the nursing issues at hand:

1. Acquire a storehouse of facts (information required to reason clinically, if not available in long term memory refer to other sources).

Learn terminology and concepts (Comprehension begins with vocabulary acquisition);

Become familiar with normal findings before being concerned with abnormal findings (e.g. Laboratory values, physical assessment findings, disease progression, growth and development);

Always ask why - find out what theories or principles explain why normal findings occur and why abnormal findings occur;

Learn problem - specific facts - clinical judgement is enhanced by your knowledge of problem presentation (signs and symptoms), cause, and management. e.g. caring for someone with a medical diagnosis of diabetes mellitus and a nursing problem of ineffective individual coping, you need a knowledge of associated signs and symptoms, common causes and common management of both problems in order to care effectively.

2. Use the nursing process as a guide to thinking - Always assess first in order to avoid jumping to conclusions. Whenever appropriate, use principles of logic to promote making judgements based on fact as opposed to guesswork;

3. Develop a systematic approach to assessment;

4. Determine a system that helps you make decisions about what must be done now, and what can wait until later:

Be sure you identify the underlying causes of the problems;

Always ask yourself, "could any of these signs and symptoms be caused by an undetected problem with structure or function of an organ or system requiring medical treatment?";

To make thinking more automatic, consistently use the same system to set immediate priorities.

5. Never perform an action if you don't know why it is indicated, why it works, and whether there are risks of harm.

6. Learn from your human resources (Faculty, experts, colleagues), and when in doubt get help from a qualified professional.

7. Become familiar with facility standards (e.g. protocols, policies, procedures, critical paths) that relate to your patients problems.

8. Practice manual skills (e.g., Handling IV tubing, changing dressings). if you are not comfortable performing these skills your ability to reason will be hampered by the stress of trying to master these technical procedures.

9. Become familiar with the technology you'll use (e.g., IV pumps, computers, monitors).

10. Remember the importance of caring (being willing to place great importance on the wants and needs of patients and their significant others).

Facione & Facione (1994) describe critical thinking as the cognitive engine which drives the processes of knowledge development and clinical judgement in nursing.

The skills and dispositional attributes of critical thinking are central to nursing in that:

They should embody a search for best knowledge in a given context;

They demand an openness to new evidence and a willingness to reconsider judgements;

They value a focused and diligent approach to clinical reasoning;

They require a tolerance of multiple perspectives / interpretations when those perspectives / interpretations can be supported by reasons and evidence.

Moreover, Facione & Facione (1994, p.5) infer critical thinking is common to both the nursing reasoning and ethical reasoning categories of clinical judgement, and that in concert with content knowledge and practical experiences critical thinking completes the essential components of clinical judgement. Thus:

> "One interprets to decode relevant information and to determine its position in the organisational structure of the knowledge base. One analyses to identify clinical problems, gaps in the knowledge base, warranted and unwarranted assumptions and judgements. One uses evaluation to determine the warranted and preferable alternatives from unwarranted or less optimal. One infers theoretical and observable relationships. And one self - regulates, confirms, corrects, one's reasoning through metacognitive reflection."

Glen (1995) implies that critical thinking in nursing is required in order that nurses educated to a high level in non - clinical settings, avoid the tendencies to become non - critical and non - discerning on introduction to the clinical environment. Moreover, Glen purports that underpinning this intellectual transition are the competing paradigms of occupational vocationalism, predicated upon a desire in clinical practice to "get the work done" with minimal reference to any explicit knowledge base. Critical thinking is thus seen as an alternative to formula - driven nursing practice and as a means of preparing practitioners to deal effectively with the vast range of

situations they will encounter, plus the problem of reliance on content which is often obsolete before it is disseminated.

Paul and Heaslip (1995, p.40) claim nurses need to be critical thinkers in order to develop the intellectual capacity to contextualise and adjust what she / he knows to particular cases. Sound practice is founded upon sound thinking whereby practitioners reason things through, direct their own thinking, and reason in a disciplined and effective way whilst engaged in solving nursing problems. Nurses must construct accurate and clear comprehension of nursing care needs patient by patient, on the understanding that each case is in some sense unique. Failing this:

> "...practice performed automatically without care, vigilance and criticism, can result in prejudice and patterns of practice which are misinformed."

They further posit that critical thinking applied reflectively in practice situations facilitates the gradual development of expert knowledge.

For Schank (1990) critical thinking skills are crucial for nursing practice due to an inherent need for nurses to think, apply, analyse, synthesise and evaluate. Such intellectual processes are necessitated by the diversity and complexity of nursing practice, derived from nursing's commitment to:

> The care of the total person;
>
> Nursing's contact with individuals of varying sociocultural and religious backgrounds;
>
> The recognition that nursing is both an art and a science.

While the first two elements are consistent with previous holistic yet individualised foundations for nursing judgement which avoids rote generalisations. The latter is not clarified in relation to whether critical thinking applies equally to both the artistic and scientific aspects of nursing or otherwise.

Jones & Brown (1991) view critical thinking as an essential component of nursing science because of nursing's unique frame of reference for dealing with human problems. This, they postulate requires a more context - driven approach as opposed to the exclusive application of scientific principles. Human interactions involve constant consideration of alternative possibilities. Thus, nursing decisions need to be explicated as the result of negotiation between alternative points of view, contradictory lines of reasoning and situational contingencies. del Bueno (1990, p.290) similarly refers to the evolutionary complexity of current nursing practice in acute settings and the inappropriateness of standardised nursing practices. She also suggests that the expansion of knowledge concerning human responses to illness constantly affects the relevance of nursing interventions. Professional nurses are, thus, required to perform technical, interpersonal, and critical thinking skills in a "...simultaneously integrated, thoughtful process."

Kramer (1993, p.406) views the importance of critical thinking in nursing as a given, due to the complexity of contemporary public and professional life. Nurses in the conduct of their practice are required to:

> "... synthesise and integrate multiple forms of knowledge to make health - affirming decisions that embody changing values."

Furthermore, critical thinking is crucial to understanding personal relationships and envisioning alternative ways to organise information and evaluate personal perspectives. Subsequently, it is also instrumental in increasing political savvy. Thus, the espoused requirement of critical thinking in nursing is founded upon nursing's focus in dealing with the health and health deficits of human beings as complex physical and holistic organisms, comprising individual ontological constructs, perspectives, abilities, levels of functioning, expectations, responses and coping mechanisms. Hence, nursing practice requires the primary acquisition, search for, discrete discrimination between, and application of appropriate domain specific declarative and procedural knowledge, in analysing or constructing arguments whilst

caring for unique patients amidst constantly changing technologies, environments and concomitant philosophies. In this sense critical thinking can apply as much to technical - rational aspects of care as it does to the more abstract humanistic aspects of care which extends beyond the realms of clinical judgement, e.g. philosophical foundations of practice and ethical dilemmas. For example, in relation to the former, nurses in the normal pursuit of their role are required to discriminate between accuracy and relevance of patient data and professional hypotheses, the validity of extradisciplinary prescriptions, standardised protocols, standardised equipment and their application to deviant cases wherein the locus of practice and patients individual context warrant alternative strategies and interventions. Practice such as this is often conducted in the face of: multiple and competing pathologies or therapies; unique physical structure; idiosyncratic social, gender, cultural or religious related norms and conventions; cognitive status; and the availability of human / non - human resources.

This requires that nurses avoid the tendencies towards automatic and simplistic generalisation of procedures in the face of vocational or socialisation forces in favour of the generation of alternative contextually sensitive perspectives and action in clinical judgement processes. This should take account of the various uses of language and meaning as interpreted by others.

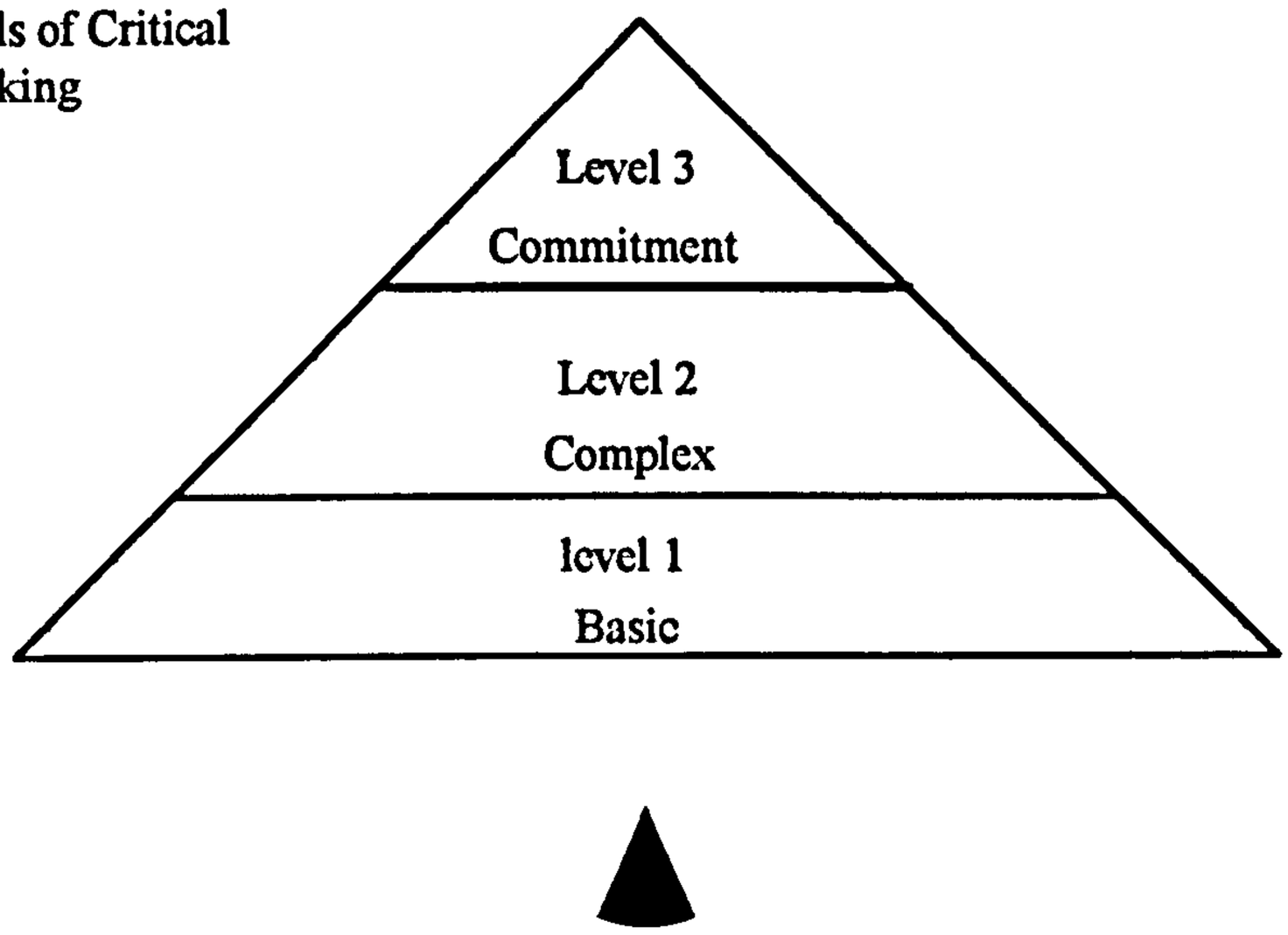
From an interdisciplinary viewpoint, critical thinking would theoretically enhance nurse's understanding and consideration of alternative domain specific knowledge, perspectives, agendas, power relationships and their impact on clinical and organisational decision making, therein developing sound professional interrelationships and political awareness.

2.8.3 Nursing Oriented Models of Critical Thinking

Despite the dearth of multi - disciplinary literature pertaining to critical thinking, there has until recently been little in the way of specific definition or conceptualisation of critical thinking in relation to nursing judgement. Kataoka - Yahiro & Saylor (1994, p.352) alone propose such a model founded upon the criticism that critical thinking in nursing has been too narrowly defined as a rational - linear problem solving activity reflecting the nursing process, or simply as the scientific process. Instead critical thinking in nursing should be defined as encompassing an interaction between all of these elements and more. In light of this purported broader multidimensional basis they define critical thinking in nursing adapted from Ennis (1985) and Kurfiss (1988) as follows:

> " The critical thinking process is reflective and reasonable thinking about nursing problems without a single solution and is focused on deciding what to believe and do."

The definition is viewed as the foundation of the model which is influenced by the work of Glaser (1941), Miller & Malcolm (1990), Paul (1993) and Perry (1970). The model comprises five components and three levels as demonstrated in fig. 2.8.3.1:



Kataoka - Yahiro & Saylor (1994), (p. 352).

Fig. 2.8.3.1 Kataoka-Yahiro & Saylor's (1994) Model of Critical Thinking as Applied to Nursing.

Specific knowledge base refers to the requirements of a specific knowledge of nursing in order to facilitate critical thinking in nursing. The authors assert for example, that one cannot identify appropriate actions for unexpected clinical symptoms without first understanding the underlying physiology. Moreover, they caution that the rush to establish critical thinking abilities in nurses must not obscure the need for basic levels of nursing knowledge on which one can then build critical thinking processes.

The experience component refers to the potential for critical thinking to be restricted by a lack of practical experience and the opportunity to participate in actual decision - making. The authors draw on the work of Benner (1984), Tanner et al. (1993), Dreyfus & Dreyfus (1986), & Schon (1983), on the espoused relationship between practical knowledge in an applied discipline and clinical experience, and the important distinction between experiential and formalised knowledge as a means of developing expert intuitive practice. Moreover, expertise developed via real world experience, facilitates reflective contexually sensitive reasoning in complex situations and reduces simplistic thinking.

The competencies component relates to cognitive as opposed to psychomotor processes and constitute three types as follows:

general critical thinking competencies;

specific critical thinking competencies in clinical situations;

specific critical thinking competency in nursing.

<u>General Critical Thinking Competencies</u>

Kataoka-Yahiro & Saylor (1994) suggest that general critical thinking competencies are not unique to nursing but are applied in other disciplines and in non clinical situations. Examples of such competencies are the scientific process, hypothesis generation, problem solving and decision making.

<u>Specific Critical Thinking Competencies in Clinical Situations</u>

These competencies refer to clinical reasoning processes such as diagnostic reasoning, clinical inferences, and clinical decision making. Once again, the authors conclude such processes are not exclusive to nursing but utilised by physicians and allied health professionals alike.

Specific Critical Thinking Competency in Nursing

This final category refers to the nursing process as a domain specific critical thinking competency. The authors cite similar criticisms of the nursing process as discussed previously, yet conclude that the nursing process is unique to the discipline of nursing. Unique in the sense that it provides a systematic, rational method for planning, providing and evaluating nursing care whilst using higher order thinking processes and a common language as a means of reasoning about client's clinical problems.

Kataoka-Yahiro & Saylor accept that the above competencies are not mutually exclusive and that a degree of interaction and reinforcement occurs between them. The nursing process for example involves both problem solving and decision making. Similarly diagnostic reasoning and clinical inference are influenced by data acquisition, decision making, hypothesis generation and diagnostic accuracy. They omit, however, to discriminate between instances of the above reasoning processes that may not require critical thinking, or that such reasoning process could be conducted in the complete absence of critical thinking. Decisions may be arrived at via an uncritical route, yet deemed competent by some practitioners. Problems may be solved in a similar fashion founded merely on idiosyncratic preference, power relationships, knowledge / experience deficits and historical ritual. The assumption cannot, therefore, be made that the conduct of general cognitive processes imply critical thinking competence in nursing.

The fourth attitude component is adapted from the work of Glaser (1941) and Paul (1993), in that it refers to certain traits of mind (Table 2.8.3.1), which are central aspects of critical thinking and indeed make it possible.

Table 2.8.3.1 Kataoka-Yahiro & Saylor's (1994) Critical Thinking Traits of Mind.

Confidence	Independence
Fairness	Responsibility
Risk-taking	Discipline
Perseverance	Creativity
Curiosity	Integrity
Humility	

The standards component comprises two parts, being intellectual standards adopted from Paul (1993), and professional standards specific to nursing. The intellectual standards (Table 2.8.3.2) reflect Paul's universal intellectual standards and evaluative framework for individuals critical thinking ability.

Table 2.8.3.2 Kataoka-Yahiro & Saylor's (1994) Intellectual Standards for Critical Thinking in Nursing.

Clarity	Precision
Specificity	Accuracy
Relevancy	Plausibility
Consistency	Logicality
Depth	Broadness
Completeness	Significance
Adequacy	Fairness

With regard to the professional standards these are deemed necessary for critical thinking in nursing in that they set a precedent for the requirement that nurses use critical thinking for the benefit of individuals as opposed to causing harm. Professional standards in this instance are enshrined in American statutory instruments and codes of professional conduct. The UK equivalent would be The Nurses, Midwives & Health Visitors Act 1979 and the clauses constituting the UKCC Code of Professional Conduct (1992).

The authors also refer to the centrality of the nursing environment in providing the context which constrains or facilitates critical thinking in addition to the individual characteristics of age, gender, culture, socio-economic status and stage of development.

Levels of Critical Thinking in Nursing

Kataoka-Yahiro & Saylor's (1994) model espouses three levels of critical thinking in nursing adapted from Perry's (1970) scheme for intellectual and ethical development. According to Perry's scheme individuals move from a position of simplistic or dualistic reasoning towards more complex relativistic and committed reasoning as they develop intellectually. In relation to the basic level of Kataoka - Yahiro & Saylor's model, answers to complex problems are either right or wrong and one right answer usually exists for each complex problem. They see this level as an early step in reasoning ability in each particular area of nursing. Characteristics of reasoning at this level are knowledge deficits, inexperience, inadequate competencies, inappropriate attitudes and non utilisation of intellectual and professional standards. A potential problem with this particular level is whether it should be construed as a level of critical thinking at all when critical thinking clearly does not exist even at the fundamental level of considering alternative perspectives. Thus, a basic level of nursing reasoning may be a more apt category than basic level critical thinking. This is not to suggest, however, that there does not exist situations in nursing where basic level reasoning does not apply. Many procedural and emergency situations have only limited answers and demand immediate rote actions, whereas lengthy deliberation could be hazardous to patient outcomes.

At the complex level nurse's answers to problems differ from the former level in that an appropriate response would be in the form of "it depends". This reflects a multiplistic position and a realisation that alternative often conflicting perspectives exist. Differing choices have benefits and costs and it is the unique aspects of the patient and context which contribute to the weighing of generated alternatives. With regard to nursing practice a common example of such reasoning is when a nurse considers deviating from a standard protocol or rule as a result of taking patient circumstances or situational context need into account. Functioning at this level

nurses find that there is more than one normal pattern and more than one solution. Accurate assessment of salient situational features is important at this level of critical thinking.

The commitment level of critical thinking differs from the complex level in that at that level one may be aware of alternative solutions to problems yet defer from commitment to any particular solution. Kataoka - Yahiro & Saylor offer an example of such thinking whereby a nurse chooses an action or belief based on alternatives generated at the complex level, yet action is withheld until a later time until presumably commitment is given to such an action. For example, a nurse may override a learned racial bias in favour of a belief from a more egalitarian perspective. This new belief may eventually result in the nurse's commitment or advocacy for improved access to healthcare irrespective of race. Should that chosen action be unsuccessful then alternative solutions are considered, utilised and so on. Implicit in this level is the ultimate need to make decisions and take action in real world practice. One cannot , therefore, consistently avoid taking action by deferring to relativism, personal choices have to be made using sound criteria, reasoning which reflects the complexity of issues and a commitment to a course of action based upon these elements.

Finally, Kataok-Yahiro & Saylor (1994) note the hierarchical nature of the levels but state that individuals can operate at differing levels depending upon the status and experience of the nurse although, commitment, is the ultimate goal.

With regard to the levels as espoused by Kataoka - Yahiro & Saylor, the prospect that all levels are representative of levels of critical thinking is problematic. As previously identified the basic level contains no obvious evidence of critical thinking at all but merely, examples of simplistic, concrete, one-sided reasoning which may appeal to authority. Level two, however, does consist of some elements of what is

understood to reflect critical thinking, namely, the generation of alternatives and an appreciation of the complexity of issues. Thus, level two may be viewed as a primary or simple level of critical thinking. Level three, the commitment level would more fully reflect true critical thinking although the authors do not clarify the nature of reasoning at this level sufficiently. Informed commitment according to Perry (1970) is characterised by the ability to evaluate the merits of alternative perspectives, to understand the contextual nature of each perspective, and make an informed personal commitment to one whilst maintaining a respect for the validity of the others in different contexts. Reasoning at this level is distinctly more evaluative, flexible and, therefore, more complex than at the two preceding levels. The levels may thus be better represented as levels of thinking generally reflecting a range of uncritical to critical thinking.

In summary, despite the problems previously alluded to regarding the issues of general critical thinking competencies and the levels of critical thinking, the model does offer a useful contribution to the debate surrounding critical thinking in nursing in that it advocates:

> critical thinking is a composite construct comprising cognitive competencies, attitudes and intellectual standard criteria;
>
> domain specific knowledge and experience as a prerequisite to complex clinical reasoning;
>
> critical thinking is required in many areas of nursing diagnostic and clinical reasoning where multiple possibilities and solutions to client problems exist;
>
> critical thinking can be utilised within the nursing process despite its purported linear characteristics, albeit the nursing process alone is not an adequate conceptualisation of critical thinking in nursing;
>
> standards of professional conduct can demand and guide critical thinking in nursing judgement;

nursing judgement processes should conform to intellectual standards.

2.8.4 Critical Thinking and Educational Issues in Nursing

Much of the theoretical literature pertaining to the above, focuses upon integrating critical thinking teaching models into nursing curricula, the role of faculty in developing learners critical thinking abilities and dispositions, or developing curricula founded upon fundamental critical thinking principles.

Malek (1986) advocated the adoption into nursing curricula of the Taba, concept formation model of teaching, as a strategy to develop critical thinking. The model is founded upon the principle that active participation in the thinking process is a more effective learning strategy than reliance on content memorisation. Malek views the model favourably because of its perceived similarities to the stages of the nursing process and its relationship between active learning and the manipulation of materials, which she claims is synonymous with the interaction between declarative and procedural knowledge. Malek (1986) utilises Taba's four teaching strategies purported to develop learner's critical thinking abilities in relation to clinical instruction as follows:

Concept formation;

Interpretation of data;

Application of principles;

Interpretation of feelings, attitudes, and values.

Concept formation is essentially the assessment or data gathering phase which should guide learner's identification of known data, the determination of common characteristics and the prioritisation of data by importance to the emerging concept.

Interpretation of data refers to the differentiation between pieces of information, the determination of cause and effect relationships and the potential meaning of

observations. These two initial phases apparently prepare the learner for the next phase.

The application of principles is seen as the analytic phase whereby learners analyse the nature of the problem situation. Malek raises the importance of not asking analytic or "why" questions until this phase based on the prospect that learners are unable to isolate cause and effect relationships until they have identified the problem. Only then can learners apply factual information in order to predict an outcome based upon cognitive principles. This phase would presumably be analogous to the planning and implementation stages of the nursing process.

The fourth phase is purported to be synonymous with the evaluation stage of the nursing process, it involves the affective domain and concerns the interpretation of feelings, attitudes, and values. This is imperative in enabling learners to examine the nature of their innate perceptions and attitudes and how this may affect their reasoning.

Underpinning Malek' s (1986) endorsement of these particular strategies is the educational principle that learning takes place through experience. Malek, however, appears to suggest that clinical reasoning experience can be provided by the use of realistic clinical teaching guides. The experience derived from such teaching guides is purported to develop critical thinking, which the learner then brings to the clinical area. Such guides should be written to encompass important clinical concepts, but written in such a manner as to provide more than one patient manifestation of the clinical concept arising from differing causal elements and contexts. Students' reasoning is also stimulated by the sequencing of particular types of question. These range from broad opening questions, e.g. "What did you notice about the skin textures of Mrs. A. and Mr. B.", (p. 22), which are intended to generate concept formation , to lifting questions whose function is to raise learner understanding or

transfer to higher levels, broaden their thinking and facilitate clinical inferences. An example of this type of question would be " What is being reflected in these observations" , (p.22).

The purported benefits of such a teaching model is that neophyte students are guided through the processes of collecting, organising and manipulating unfamiliar information in sometimes new and overwhelming environments. The strategies may also be adapted to suit learners at advanced levels of knowledge, cognition and autonomy. The sequencing of the strategies would appear crucial in this model, and according to Malek avoids the common educational mistake of initiating analysis prematurely. The effect of which, in light of knowledge and experiential deficits, invokes rote deductive conclusions as opposed to deliberative inductive alternatives and a realisation that knowledge is not static.

Despite the absence of a description or definition of critical thinking Malek's (1986) utilisation of Taba's strategies does concur with issues commensurate with critical thinking as follows:

The development of cognitive skills such as interpretation, analysis and inference;

The generation of alternatives in light of changing knowledge and contexts.

The sequential nature of the model, particularly up to the third stage could be criticised by those who conceive of critical thinking as essentially a non - linear process or, conversely could be applauded by those who see domain specific knowledge as a prerequisite to critical thinking. With regard to critical thinking dispositions, however, no mention is made and the strategies outlined appear to assume the development of such dispositions. The transfer of critical thinking ability and disposition from educational environs to that of clinical environs is also assumed.

Burnard (1989, p.271) also comments on the educationalist's role in the development of critical ability in nursing students. He makes the distinction between education and

training as a means of differentiating between the outcomes of each approach. Education, he asserts reflects an "...evolving critical process which enables the learner to make decisions for herself through the exercise of rational thought." Conversely, training, "...suggests rote learning and the blind absorption of other people's thoughts beliefs and skills." Burnard offers suggestions as to how nurse teachers might develop critical thinking ability in their students by incorporating aspects of the work of Brookfield (1987). These include:

Affirming critical thinker's self worth:

i.e. critical thinkers should be viewed as risk takers and innovators. Teachers should thus encourage and support learner's critical thinking endeavours. He cautions, however, that this does not mean wholesale uncritical acceptance of all ideas, but an attitude of openness and flexibility towards the learner's efforts;

Listening attentively to critical thinkers:

i.e. as in nursing practice, listening is an importance element in critical thinking ability. Teachers need to avoid reactive tendencies to steer learners who express critical ideas back towards the status quo and appreciate challenging ideas. Attentive listening enables the teacher to enter the critical thinker's frame of reference and understand the proposer's thought processes.

Be a critical teacher:

i.e. teachers should avoid utilising what Burnard calls the 'banking' approach to teaching, where learners are filled with predetermined facts. Instead teachers should adopt a problem posing approach where specified learning objectives are avoided and learners and the teacher examine their taken for granted ideas about the world. Being a critical teacher involves being prepared to take risks with oneself and learners in order to move thinking forward. Burnard also stresses that the term critical teacher must not be construed as an opportunity for negative criticism of learner's efforts in the traditional sense of the term.

Teachers should model critical ability:

> i.e. if teachers are to expect critical thinking from their learners, they too need to consistently demonstrate abilities in avoiding defensive, reactionary thinking. In this sense teachers must remain open to new ideas and recognise that they can also learn from their students. Thus education may become a reciprocal process where roles are sometimes switched in the learning encounter.

Encourage breadth of reading:

> because of the changing boundaries, validity and contexts of knowledge learners should be encouraged to read widely. Knowledge may be sought in domains other than nursing, for it is only by absorbing other perspectives on the world that individuals become questioning and thus critical thinkers.

Learn to shut up!:

> according to Burnard, many nurse teachers do too much talking in the classroom. Critical thinking may be stifled if learners are not afforded the opportunity to voice their thoughts and emotions. Teacher silence he contends can be a useful tool in educational encounters.

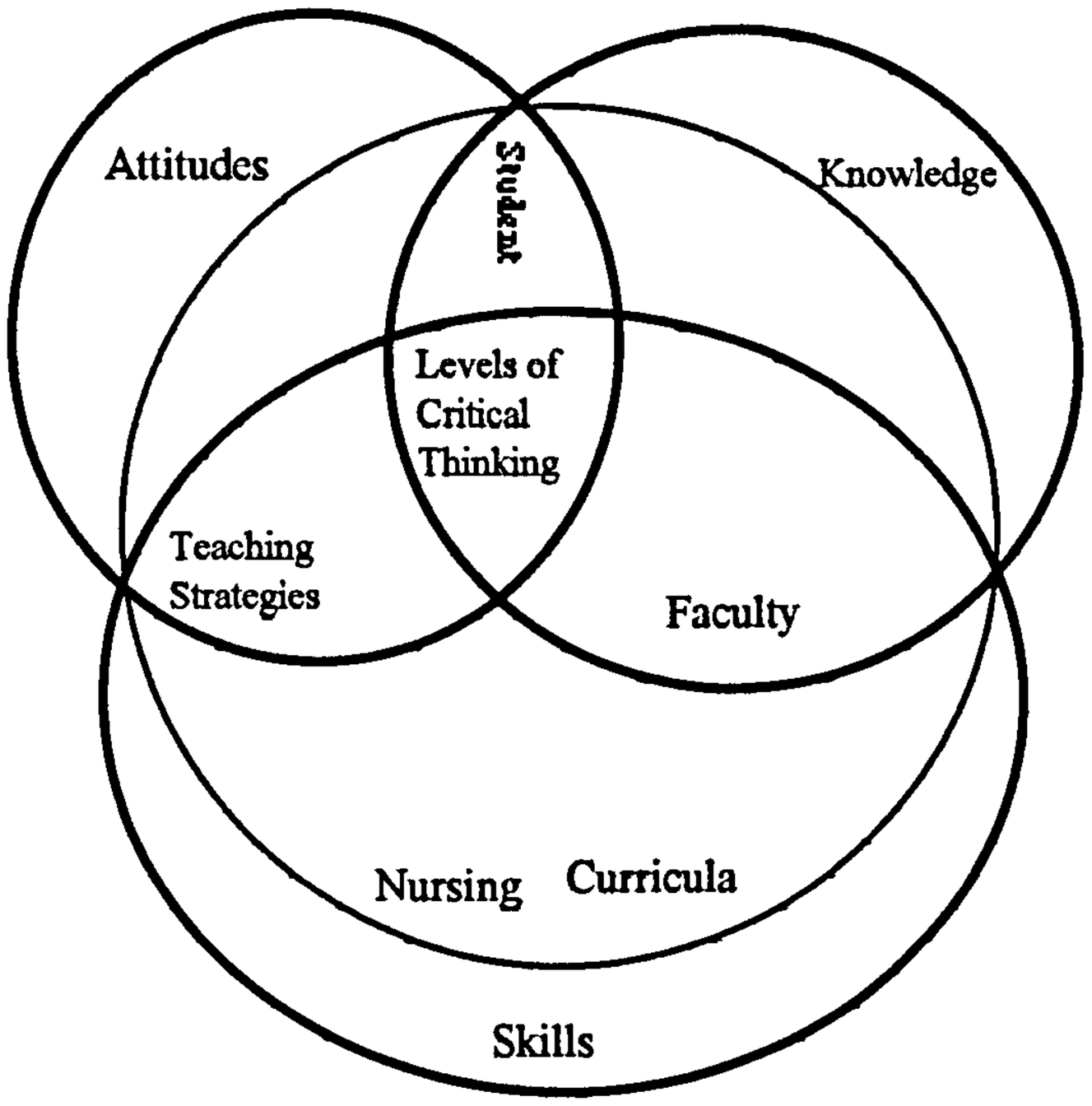
Be conversational:

> talking with learners as opposed to talking at, or to, learners does much to enhance the free development of critical thinking. Many learning encounters are spoiled by teachers playing out a particular 'teacher role'. Adopting a more normal everyday conversational tone whilst teaching helps to facilitate an equal relationship between teacher and learner.

Burnard's (1989) guidelines clearly delineate some of the responsibilities and strategies to be adopted by nurse teachers, as a means of developing critical thinking in their students. Although he offers useful strategies aimed at achieving this end, the scope of his work is limited in that it only refers to Brookfield's four components of the construct. This in itself may contravene the component of imagining and

exploring alternatives. Little mention is made of specific skills, dispositions, or the responsibilities of learners themselves. Similarly, the issue of specifically assessing critical thinking as an educational outcome is not raised.

Miller & Malcolm (1990) similarly advocate an increasing emphasis on curricular strategies which facilitate and support critical thinking in nursing education. They offer a model which portrays an interaction between a variety of elements in the form of knowledge, skills, attitudes, students, faculty, teaching strategies, nursing curricula and how these contribute to individual's levels of critical thinking. The nature of the interaction is represented in the form of overlapping circles and ellipses. Fig. 2.8.4.1 reproduces their framework for evaluating critical thinking achievement in nursing curricula.



After Miller & Malcolm (1990)

Fig. 2.8.4.1 Miller & Malcolm's (1990, p.70) Interactionist Model of Critical Thinking.

The dotted (inner) nursing curricular line is meant to represent the semipermeable nature of the curriculum in how it draws from life experiences and knowledge outside of the curriculum, as well as curricula design elements. The semipermeable curricular membrane is also said to facilitate the ebb and flow of new and old knowledge, skills and attitudes as appropriate.

With regard to attitudes Miller & Malcolm (1990) assert that, it is these which set the tone for inquiry and is contingent upon individual perspectives or mind sets. They further assert certain responsibilities and behaviours are incumbent upon both learners and faculty members in initiating and maintaining an open minded approach in interpreting events. Students attitudes, they point out, are affected by many extraneous variables such as age, nature of life experiences, state of health, level of cognitive and psychological development, family and cultural modelling, educational attitudes and assumptions. These variables, they claim, in conjunction with students desire to be good nurses and good students, often result in a desire for black and white answers and security in assurances of correctness in patient situations. Moreover, they also recognise that the same variables could apply to faculty members, and how this may impact on their theories of learning, teaching strategies and assumptions which underpin their attitudes. Table 2.8.4.1 identifies what they claim to be common faculty assumptions which may hinder the development of critical thinking in students.

Table 2.8.4.1 Miller & Malcolm's (1990) Common Faculty Assumptions.

1. Beginning students do not know how to problem solve;
2. Mistakes are always bad, costly, and to be avoided;
3. There is a best way to think;
4. What is taught is what is learned;
5. All students are plus or minus one standard deviation from the mean;
6. Certainty is good whether it is client outcomes or student actions;
7. Complex clients are defined as those who are most sick;
8. A standardised nursing care plan fits all clients;
9. Begin with less complex learnings and progress to more complex ones;
10. Students should be able to make expert decisions upon graduation;

11. Students should be capable of working in any clinical area upon graduation;
12. The nursing programme philosophy has been operationalised in the curriculum;
13. Faculty knows best.

Overcoming such student and faculty attitudes is essential if a critical thinking culture with concomitant outcomes are to be achieved. Miller & Malcolm (1990) suggest that faculty need to develop a flexible and contextually sensitive approach to teaching strategies, which enables learners to appreciate, that specific nursing interventions are based upon hypotheses that may or may not be proven useful after testing in the actual care of a client.

With regard to knowledge, Miller & Malcolm (1990) take the position that one cannot think critically without a knowledge base on which to build arguments. Moreover, they discount the rote teaching of thinking in its own right which is divorced from the knowledge base of the intended discipline. Instead they assert that faculty have a pivotal role in conveying to students the imperative relationship between inquiry, critical thinking and the development of nursing knowledge and practice. This they suggest can be achieved by faculty acting as critical thinking role models, and by clearly explicating the expected behaviour of students in the application of knowledge in clinical situations. Faculty can be assisted in this endeavour by the increasing body of knowledge surrounding critical thinking itself and associated teaching strategies. In this sense, Miller & Malcolm seem to imply that knowledge has to be critically acquired as well as critically applied, and that faculty have the abilities and dispositions to demonstrate this in their teaching. In light of the one - sided nature of the assumptions appearing in table 2.8.4.1 and their implied frequency, the assumed role modelling capabilities of faculty may be unwarranted.

The skills component of the model focuses on cognitive skills as opposed to psychomotor nursing skills. The authors refer not only to an array of critical thinking

processes, but also to the development and refinement of such skills by practice. The processes are identified as follows:

Separating relevant from irrelevant data;

Making clinical inferences from the data;

Recognising unstated assumptions;

Reasoning deductively;

Weighing clinical findings and other evidence;

Distinguishing between warranted and unwarranted generalisations;

Interpreting and evaluating arguments.

Developing and practising such skills will, it is claimed, enable learners to value their cognitive processes and their products, in the form of correct answers. Critical thinking skills facilitate learners in focusing on the largest relevant picture of the client's current circumstances and, therefore, promotes complex problem solving. Miller & Malcolm (1990) conclude that opportunities to practice such skills are the responsibility of nurse educators. Faculty members should in this respect, utilise teaching strategies which mediate the application of critical thinking skills in learning encounters, as opposed to passively listening to lectures. Similarly course assignments should be constructed to engage learners in more problem solving activities, in the form of case study analysis, position papers, and opportunities to discuss and reflect on important nursing issues.

Miller & Malcolm's (1990) model is useful in clarifying the complexity of issues confronting educators and learners in attempting to integrate critical thinking developmental strategies into nursing curricular. They clearly advocate and underline the responsibility of faculty members as role models in inculcating critical thinking in their learners. This they assert may involve a significant degree of self awareness in regard to their own attitudes in considering alternative perspectives and change. Although they incorporate the works of Watson & Glaser (1980); Kolb (1978) and

Perry (1970), their conception of critical thinking appears vague in that it refers to useful desired reasoning behaviours and outcomes, but does not detail the precise constituents of critical thinking. There appears also a degree of internal inconsistency whereby they refer to the need for complex flexible, contextually sensitive reasoning, but ultimately focus on the product of reasoning as the 'correct' answer, as opposed to the 'best' answer. It is also unclear as to why they stipulate that critical thinking should not be taught as a discrete entity, when they draw on the work of Watson & Glaser (1980), who describe it and measure it as a discrete entity. They make an interesting point regarding assessment in that they believe if critical thinking is to be developed, then practice in the associated skills is required. Consideration should be given to constructing course assignments which place greater demands on reasoning as opposed to memorisation and knowledge recall, no mention is made, however, as to how this would apply to clinical aspects of the curricula. Finally, having raised the issue of levels of critical thinking they do not elaborate upon what these levels are, or what they should consist of.

While the previous works emphasise the integration of critical thinking strategies into existing curricula, Ford & Profetto McGrath (1994) assert that curricula should be underpinned by appropriate critical thinking perspectives in their development. They draw on the works of Friere, Habermas, and Grundy in contending that nursing curricula may be informed by either a technical, practical, or emancipatory interest. Curricula informed by these interests are referred to respectively as curriculum as product, curriculum as practice, and curriculum as praxis. Table 2.8.4.2 clarifies this relationship.

Table 2.8.4.2 Ford & Profetto-McGrath's (1994) Categories of Curricular Perspectives.

Technical interest	=	Curriculum as product
Practical interest	=	Curriculum as practice
Emancipatory interest	=	Curriculum as praxis

Curriculum as product is predicated upon a technical interest concerned with controlling the environment through rule based action derived from empirically grounded laws. Viewed from an educational context this particular orientation focuses on controlling the educational environment in order to achieve predetermined goals or objectives. The educational encounter is deemed successful if the students function to the predetermined standards. The authors posit that the instrumental nature of such a curricular model fosters the type of action where a subject acts upon an object, as opposed to interaction between subject and object.

Curriculum as practice is associated with a practical orientation where the fundamental interest is in "...understanding the environment through interaction based upon consensual understanding of meaning" (p. 341). Consenual understanding and the making of meaning is founded upon interaction between subjects. The emphasis in this orientation is on understanding for the sake of doing things right. This requires the exercise of judgement. Action in this context follows deliberation. Ford & Profetto - McGrath suggest that where curriculum as practice dominates "...it tends to frame the situation within the parameters of the tradition and excludes, by its nature, the need for critical reflection" (p. 342).

Curriculum as praxis refers to the development of a critical consciousness, freedom from traditionalist dogma and autonomy. Action is this orientation follows the generation of what is termed authentic knowledge which is derived from critical

reflection. In describing critical reflection the authors draw on the works of Hedin, Shor & Friere. Thus, thinking critically and reflectively consists of going "...beneath the surface structure of a situation, to reveal the underlying assumptions that constrain open discourse and autonomous and responsible action" (p. 343). As perception and understanding of situations change individuals are able to question what they previously have taken for granted.

Ford & Profetto - McGrath claim that there currently exist parallel demands in nursing education. One is for a paradigm shift in curricula development from technical models to emancipatory ones. This is in response to concerns relating to the perceived limitations of behavioural models of nursing education in their ability to meet society's changing health care needs. The other is for the development of critical thinking abilities in nursing students. Moreover, they suggest the potential for each of the above curricular models to represent differing conceptualisations of critical thinking, as follows:

<u>Critical thinking as problem solving</u>

Ford and Profetto - McGrath contend that the prevailing conception of critical thinking in nursing is that of critical thinking as problem solving. This conception is founded upon the prevalence of the nursing process and its problem solving stages within nursing curricula. This, they assert is compatible with a technical interest and knowledge in the form of facts and rules. Thus a curriculum as product orientation reflects the fundamental principles of objectivity, prediction and control. The authors do not, however, make clear the limitations of critical thinking as problem solving. They do not elucidate why and when problem solving reasoning processes are more or less elaborate than the reasoning processes underpinning critical thinking, or how practice may be affected by this.

Critical Thinking in Curriculum as Praxis

Critical thinking as praxis is said to differ from problem solving in that it is based upon emancipatory action research as described by Grundy (1989, p.154) which "...mediates between theory and practice through the process of enlightenment." Knowledge in this orientation is described as authentic in that it does not rely on facts or rules. Neither should it be equated merely with information, but rather composed of patterns which make sense, and insights which facilitate the building of cognitive structures. Authentic knowledge extends the limits of presenting situations by including larger socio-political, historical, and economic contexts thus exposing the fundamental inherent power relationships which can oppress and maintain the status quo. Relating the emancipatory interest to critical thinking as a curriculum as praxis, the authors propose that such an approach to curricular design enables learners to take account of the larger social context of situations by revealing underlying assumptions and ideologies. Critical reflection of this nature has two facets. One refers to a critical examination of individuals' own practice. The other relates to a critical understanding of situations and systems which perpetuate the status quo. Hence, learners are able to examine the knowledge and assumptions which guide their own practice, and make explicit the implicit environmental conditions surrounding their practice.

Ford & Profetto McGrath (1994) propose an interesting case for a paradigm shift in the principles underpinning nursing curricula. Based upon critical social theory, their model reflects a rejection of the prior concentration upon content acquisition, ritualistic practice and the implicit domination of one discipline within a field by others. Whilst obviously favouring an emancipatory curricular model they do not address the issues of specific skills or dispositions required by learners in order to conduct such emancipatory reasoning. In respect of this, they appear to assume that critical thinking will result from encouraging learners to focus upon the larger socio-political, historical and economic picture surrounding instances of practice, at the

expense of knowledge established by other means. The notion of curriculum as practice appears vague and in some areas contradictory. The terms consensus, interaction between subjects, deliberation and judgement, appear incongruent with the notion of framing situations from singular references. Their conception appears to take a radical view and avoids the questions of whether nursing practice can really be exclusively devoid of contemporaneous facts and rules, or, whether there is a place for all three orientations within nursing curricula to account for contextual contingencies, with critical thinking ability functioning as the arbiter.

This section has examined and evaluated the theoretical perspectives surrounding the issues of: the relationship between the nursing process and critical thinking in nursing; the perceived need for critical thinking ability in relation to nursing practice; the construction of nursing oriented models of critical thinking; and critical thinking in relation to nursing education issues. There is evidently overwhelming support for the espoused interdependence between competent clinical nursing practice and abilities in critical thinking. This is based upon the general conception of nursing as a complex human, social, and professional activity requiring appropriate intellectual skills and affective dispositions that facilitate the conduct of complex reasoning, decision making, and clinical judgement. The theoretical literature is thus both plausible and laudable in its collective intention of espousing the requirements for and models of inculcating critical thinking in learners and practitioners. However, without any recourse to empirical evidence relating to the existence of critical thinking in practice or its developments a result of nursing education the question arises of "is it there?" The next section will examine studies designed to address elements of this question.

2. 9 Empirical literature Related to Critical Thinking in Nursing

This section will review relevant nursing literature available during the study design and data collection phases of the study's development. Subsequent literature will be discussed in light of the study's findings.

Previous studies are predominantly American and have investigated the relationship of critical thinking to various factors. These are categorised as follows:

Critical thinking as a correlate of success in nursing;

Effects of Nursing education on critical thinking ability;

Effects of different types of nursing programmes on critical thinking;

Relationship of critical thinking to clinical decision making, professional nursing competence, and moral reasoning.

Categories of Critical Thinking Studies (After Beck et al., 1992).

2.9.1 Critical Thinking as a Correlate of Success in Nursing

Teissen (1987) studied which variables correlated most strongly with the critical thinking ability of students in a four year undergraduate nursing programme. Eight independent variables were examined as follows:

Standard Achievement Test verbal scores (SAT, V),

Standard Achievement Test quantitative scores (SAT, M)

Grade Point Average (GPA)

Age;

Total number of college credit hours in the natural sciences (NSCI);

Total number of college credit hours in the behavioural / social sciences;

Total number of college credit hours in arts and humanities (AHUM)

Total number of college credit hours in professional nursing courses.

Critical thinking was measured by means of the Watson Glaser Critical Thinking Appraisal (WGCTA) for a sample of 150 subjects. Significant correlations were found at the p< .01 level for SAT M (.38), SAT V (.33), GPA (.32), & AHUM (.30). Multiple regression revealed a correlation between critical thinking ability, SAT M, AHUM, and GPA of .49, accounting for 24% of the variance in critical thinking. The remaining variables were intercorrelated with SAT M, AHUM, & GPA. Teissen reported math ability correlated most strongly with critical thinking, and as she believed this was a critical ability for nursing practice was, therefore, a good predictor of success in a nursing programme and a valid admission criterion.

Bauwens & Gerhard (1987) investigated the early predictors of success in a Baccalaureate of Science in Nursing (BSN) programme. This correlational study used the WGCTA as the instrument for critical thinking measurement. Subjects were a convenience sample of 159 volunteer students. Results suggested that entry critical thinking scores and pre-nursing GPA showed positive correlation with the registered nurse licensing examination (NCLEX) scores. There appeared to be no significant differences between entry and graduation critical thinking scores.

Gross, Takazawa, & Rose (1987) studied the utility of critical thinking and the National League of Nursing (NLN) pre-admission examination scores as selection criteria, in conjunction with the effect of nursing education on critical thinking ability. Study design was correlational, with pre-test and post-test method with no control group. WGCTA was the instrument of choice for a convenience sample of 120 students undertaking associate or baccalaureate programmes. Results showed positive correlation with entry critical thinking scores and NLN total with the BSN students' GPAs. No significant correlations were found with the maths NLN, nor with the NCLEX scores of either group. There were significant increases in critical thinking scores from entry to graduation for both groups.

All three studies investigated the correlations between critical thinking and other variables as predictors for selection purposes, but not as variables which can be manipulated (Beck et al. 1992). Although critical thinking was found to be a useful predictor of success, these correlational studies give little indication of, whether and if so, how, nursing programmes can improve learner's critical thinking abilities. Moreover, although two studies compared changes in critical thinking from entry to exit ; Bauwens & Gerhard (1987) & Gross et al., (1987) the former found no significant changes, while the latter reported highly significant changes. Beck et al. (1992) suggest this could be due to the relatively small samples used for a phenomenon of this nature.

2.9.2 Effects of Nursing Education on Critical Thinking Ability

Valiga (1983) investigated the cognitive development of nursing students at different stages of their courses, over the course of an academic year. This comparative study used a pre-test/post-test design with no control group. Critical thinking was measured using the Kne-We (Perry Scheme) which has a different conceptual basis to the WGCTA. Sample consisted of random selection of 123 students across three courses from a pool of volunteers. Results on both pre-test and post-test demonstrated significantly higher scores for seniors over freshmen. There were, however, no significant changes from pre-test to post-test for any particular group, with the majority of student's individual scores and all the mean scores falling into the dualism category of Perry's stages of cognitive development .

Berger (1984) pondered the relationship between critical thinking and GPA? The differences between critical thinking abilities of BSN students and Liberal arts students and whether there existed changes in critical thinking abilities of BSN students from their sophomore to their senior years. This correlational, comparative study used pre-test/post-test design with no control, and the WGCTA instrument for a sample of 137 students. (selection criteria indeterminate). Results indicated no

significant correlation between critical thinking and GPA. Sophomore nursing students demonstrated higher critical thinking scores than freshmen or senior liberal arts students. There were significant increases in the nursing student's critical thinking scores from their sophomore to their senior year.

Sullivan (1987) investigated the relationships among critical thinking, creativity, clinical performance, academic performance and whether critical thinking improved during a two year RN to BSN programme. Study design was correlational with a pre-test / post-test and no control. Instruments used were the WGCTA, Torrence test of creative thinking and the Slater - Stewart Evaluation of Nursing Scale for a sample of 51. Results showed positive correlations between individual students' entry and exit critical thinking scores, and between entry / exit GPA and creativity measures. There was no change in average critical thinking scores from entry to exit.

Fleeger (1987) studied the effect of baccalaureate nursing programmes on critical thinking as an aspect of a larger study. This was a correlational study using the WGCTA on a cross-sectional sample of 91 students from years 3,4, &5 of a five year BSN programme. The analysis revealed no significant differences among the groups in critical thinking abilities. Results from this study did not support the position that baccalaureate nursing education improved critical thinking abilities.

Miller (1992) in contrast reported significant differences between pre-test and post-test scores using the WGCTA with a sample of 137 students on a Baccalaureate nursing degree programme in the USA. Two of the research questions focused upon the differences in pre and post-test scores for the test as a whole and the five sub-test scores. One tailed t-tests revealed significant differences in both sets of scores ($P<0.05$). Miller (1992),thus, concluded that the findings were consistent with the expectation that enrolment on the Baccalaureate Nursing Degree programme would have a positive impact upon the overall critical thinking skills of students. She

cautions, however, against the prospect that critical thinking should be viewed as a skill that could be taught in a discrete unit, suggesting that this may produce compliant behaviour as opposed to an independent spirit of inquiry.

Saarmann, Freitas, Rapps & Riegal (1992, p.26) decided to investigate the relationship between education, critical thinking ability and values from a sociological perspective. The purpose of the study was to test the following assumptions:

> "If exposure to faculty is a major influence on critical thinking ability and professional values, then faculty must be assumed to be superior in these characteristics."
>
> "Students exposed to faculty in longer curricula can be expected to achieve higher levels of critical thinking ability and professional values than those undertaking shorter curricula."

A cross-sectional survey incorporating four nursing educational institutions and local hospitals used a convenience sample divided into four subgroups of 32 derived from power analysis techniques. The sample, thus, included: members of Faculty (32); graduating baccalaureate in nursing (BSN) students (32) associate degree prepared practitioners (ADN) (32); and sophomore college students entering a BSN course (32). Research instruments included the Watson & Glaser Critical Thinking Appraisal (1964) and Gordon's Personal and interpersonal Values Scales. Results demonstrated that the critical thinking ability of faculty was not significantly higher than that of sophomore nursing students when the influence of age is controlled. With regard to professional values the three nursing groups demonstrated striking similarities. Faculty valued achievement most highly (p.0001), while sophomore students valued goal orientation most highly (p.001). All subjects valued support highly but sophomore students singularly valued benevolence highly. The authors contend that: as in previous studies investigating critical thinking ability, age is an important influence.

All but the latter two of this group of studies used pre-test/post-test design without control groups in order to study changes in entry to exit critical thinking abilities. The absence of a control group means one cannot rule out the internal threats to the validity of these studies posed by history and maturation. It is not, therefore, possible to discount the general effects of college experience and maturation in explaining the increases in critical thinking levels from entry to exit in these particular studies.

2.9.4 Effects of Different Types of Nursing Programmes on Critical thinking.

Lynch (1988) investigated the relationship between critical thinking, age, SATs and how the critical thinking abilities of generic BSN students compare with those of Associate Degree students. This correlational comparative study utilised the WGCTA on a convenience sample of 87 AD and 74 BSN students. Results indicated there was no correlation between critical thinking and age. There was a positive correlation between critical thinking and SATs. The critical thinking abilities of the BSN students were significantly higher than those of the AD students.

Kintgen-Andrews (1988) posed the question, how do critical thinking abilities and their development differ among career ladder PN students, AD students, pre-health science freshmen and BSN sophomore students? This comparative study used a pre-test / post-test design with the WGCTA on a cross section convenience volunteer sample of 177 students. Results demonstrated no significant differences in critical thinking abilities between the PN students and the pre-science freshmen. The BSN sophomores had significantly higher critical thinking abilities than the AD students. There were no significant increases in critical thinking abilities in any group over the course of an academic year.

2.9.5 The Relationship of Critical thinking to Clinical Decision Making, Professional Nursing Competence and Moral Reasoning.

The following studies examined differences in critical thinking among different types of nursing programmes, plus the relationships between critical thinking and clinical decision making, diagnostic ability, nursing competence, and moral reasoning.

Brooks & Shepherd (1990) investigated the differences in critical thinking and clinical decision making, and whether critical thinking and clinical decision making abilities among Diploma, Associate Degree (AD) RN and generic BSN students differed. This correlational, comparative study used the WGCTA and Govers Nursing Performance Simulation Instrument (1975) on a cross section convenience sample of 200 students. Results showed a weak but significant relationship between critical thinking and clinical decision making in all programmes. The critical thinking of students from both types of BSN programme were significantly higher than those of the Diploma and AD students. There was no significant difference between the critical thinking abilities of the RN and generic BSN students. However, the clinical decision-making abilities of the RN students were significantly higher than those of all other groups.

Pardue (1987) studied the differences in critical thinking and clinical decision making among graduates of Diploma, AD, BSN and MSN programmes. This comparative study used the WGCTA plus a researcher designed clinical decision making tool, on a stratified random sample of RNs of which 121 volunteers were recruited from all programmes. Results revealed the critical thinking abilities of BSN & MSN graduates were significantly higher than those of Diploma and AD graduates. There were no significant differences among any of the groups in clinical decision making abilities.

Matthews & Gaul (1979) examined the relationship between critical thinking ability, nursing diagnostic abilities, and whether these abilities differed between senior BSN students (undergraduate) and graduate (postgraduate) students. Study design was correlational, comparative, using the WGCTA and a researcher developed case study to test nursing diagnosis ability. Sample size was 48 of which 22 were BSN students and 26 Graduates. Results indicated no correlation between critical thinking ability and ability to derive nursing diagnoses. There were no significant differences between groups in terms of critical thinking abilities. Graduate students, however, were significantly better at identifying nursing diagnoses than the BSN students.

Ketefian (1981) investigated the relationships among critical thinking, moral judgement, level of educational preparation, and whether levels of moral judgement differ between nurses prepared at baccalaureate degree level or above (professional) and nurses prepared at diploma or associate degree level (technical). Study design was correlational, comparative, incorporating the WGCTA and Rest's Defining Issues Test, on a volunteer sample of 36 technical level and 43 professional level RNs. There was a significant positive relationship between critical thinking and moral judgement. Critical thinking and level of education together were significantly correlated with moral judgement. The moral judgement levels of professional nurses were higher than those of technical nurses.

2.10 Summary of Empirical Nursing Literature Review.

The above empirical nursing literature review indicates an inconclusive body of evidence. While some individual studies provide supporting evidence for the effect of nursing education on the development of critical thinking ability others do not. Consequently, the following conclusions are drawn:

1. Strong support for a positive effect of nursing education on generic critical thinking ability is lacking;
2. Strong support for the relationship between critical thinking and success

in nursing education is lacking;

3. There is virtually no evidence to support correlation between critical thinking and clinical judgement (Pless & Clayton 1993).

The variables of age, general educational achievement indicators, level and stage of professional education, sample size and methods appears to demonstrate little effect overall. Additionally, the literature reveals: a paucity of UK studies investigating critical thinking as a distinct outcome of nursing education; the prevalence of standardised quantitative approaches to measuring critical thinking in nursing; a heavy reliance on the WGCTA as a measure of nurse's critical thinking abilities; and a paucity of studies investigating qualitative evidence of critical thinking in domain specific concurrent nursing judgement or reasoning processes. Therefore, while there is a body of evidence which suggests nursing education has little effect upon nurses' critical thinking abilities, the evidence is generally in the form of non-significant changes in standardised tests scores. The evidence to date, thus, does not provide insights into why this might be the case or more specifically, how nurses and student nurses actually reason about professional issues or form professional judgements.

CHAPTER THREE

Overview of the Relationship Between the Curriculum and Critical Thinking - Registered Nurse/Diploma in Higher Education (RN/Dip. H.E.)

3.1

The above course led to a Council for National Academic Awards (CNAA) diploma in Higher Education and professional registration on the appropriate part of the UKCC register. The Project 2000 initiative afforded the opportunity for not only increasing links with higher educational institutions, but also to move towards the development of modular and semester based courses. The ENB requirement, however, that nursing courses be based upon a forty-five week year as opposed to the usual thirty-two weeks academic year operated by higher educational institutions made this task problematic. Consequently, the course year consists of three fifteen weeks trimesters (45 wks), with the three year programme comprising nine trimesters in total divided between a Common Foundation Programme and a variety of Branch Programmes (135 wks). Typically, a student would study four modules per trimester, with each module requiring 150 hours study of which 45 hours is the minimum teacher contact time. The trimesters' sequence and structure reflect the health-to-illness continuum concomitant with the philosophy of Project 2000 (Macneil & Cavanagh, 1995). Appendix 1 demonstrates this sequence and subject content.

Trimester one introduces students to the concept of health with trimester two then concentrating upon factors potentially detrimental to health. In trimester three students begin to observe and participate under clinical supervision in aspects of nursing care for a variety of patient groups. Trimester four facilitates student reflection upon experiences encountered in trimester three. The predominant function of trimester five is to act as a bridge between the Common Foundation Programme

and the forthcoming Branch Programmes. Trimesters six, seven and eight enable students to further develop the knowledge and skills acquired in the Common Foundation Programme by nursing patients specific to their chosen speciality in hospital and community settings. During trimesters seven and eight students complete their rostered service whereby they function as a constituent member of the caring team and not in a supernumerary capacity. Finally, trimester nine serves a dual function. Firstly, it enables students to reflect upon the experiences encountered during rostered service. Secondly, it encourages students to consolidate their knowledge of management, teaching and research to provide a foundation for lifelong learning as a registered practitioner.

3.2 Credit Accumulation.

The three year programme attracts 120 academic credits at level 1 for the Common Foundation Programme and 120 academic credits at level 2 for the Branch Programmes. Credit level is determined by: the intellectual demands of modules; the number of hours allocated and the nature of assessment. Academic credits are awarded also during periods of clinical practice calculated by the amount of educational input in hours per week, e.g. 10 hrs over a 15 weeks module equals 150 hrs and, therefore, 15 credits at level 1 in CFP and similar credits at level 2 in the Branch Programme and rostered service (Macneil & Cavanagh, 1995).

3.3 Course philosophy

The programme is founded upon the following philosophical perspective extracted from the submission for validation document (Fig. 3.3.1):

"The philosophy of the Sister Dora College of Nursing and Midwifery embodies the belief that Nursing/Midwifery are dynamic activities that encompass aspects of caring for people of all ages and groups. We believe they should be holistic and individualised in their application.

We believe education is a life-long process and that Nurses/Midwives engage in a variety of interpersonal relationships which, to be most effective must rest on a range of empathic and imaginative skills together with a commitment to continuing professional and personal development. Professional behaviour is balanced by both liberal and specialised education drawn from biological and behavioural sciences, complemented by knowledge of social policy, and social aspects of health and disease. In order to meet these teaching needs, the teacher must see him/herself as facilitator of students' intellectual and personal growth within an adult learning model. Thus the acquisition of higher order concepts is achievable by helping the student to make meaningful connections between previous experience and new knowledge.

The educational programme will offer students the opportunities to conceptualise quality in health and health care. Students will then begin to develop or maintain an awareness and appreciation of the application of such concepts to a range of Nursing/Midwifery situations. Embodied in this process is the intention to enhance critical and analytic skills in order to evaluate the contribution of all complementary and practical perspectives in health care.

The College acknowledges the need to be sensitive to the needs of mature students and to that end it offers a flexible approach to nurse education", (p.11).

Fig. 3.3.1 Educational Philosophy/Strategy

With regard to the context of this study the above educational philosophy refers to the holistic, yet unique contextual contingencies inherent in clinical reasoning processes, and the value placed upon the development of critical thinking as an

intellectual requisite for generating and evaluating alternative perspectives of health and health-care.

3.4 Curriculum Framework Model

The course curriculum is also founded upon the Experiential Taxonomy of Steinaker & Bell (1979). The taxonomy identifies five categories and associated sub-categories purported to be measurable characteristics of learning in the experiential domain and demonstrate a natural progression of practical competence (Table 3.4.1). The claim is made that the use of experiential taxonomy categories is appropriate to all levels of learning and not only in relation to practice. The vital link between modules of study and claim for advancement is the quality of the assessment scheme and its level of sophistication. The categories are as follows:

Table 3.4.1. Steinaker & Bell's (1979) Categories Within the Experiential Domain

1. Exposure	Lowest level of experiential learning
2. Participation	
3. Identification	
4. Internalisation	
5. Dissemination	Highest level of experiential learning

The following curricular descriptions of the taxonomy categories are also offered for clarity.

Exposure - Students are exposed to the specific knowledge or experience. They are encouraged to focus their attention and senses on given stimuli and then reflect upon the experience encountered.

Participation - The student is expected to participate under supervision, in the giving of care. At this stage the student is also expected to demonstrate a willingness to take part and explain actions and

behaviours.

Identification - This level of attainment implies that the student now accepts and becomes guided by the knowledge and skills already acquired. The knowledge, skills and total experience now influence his/her thinking, professional behaviour and subsequent interaction with similar data or experience. The individual begins to share their experience with others overtly relating self to experience, understands the organising principles gains deeper insight into structure and values, and is able to recognise strengths and limitations.

Internalisation - Implies that the student becomes fully socialised in nursing knowledge, skills and total experience now influence his/her thinking, professional behaviour and subsequent interaction with similar data or experience. The individual begins to share their experience with others, overtly relating self to experience, understands the organising principles and gains deeper insight into structure and values, and is able to recognise strenths and limitations.

Dissemination - Whilst teaching and role model activities can occur at earlier levels, this level denotes the highest degree of competency and efficiency for at this stage the individual is able to compare, contrast, defend and teach. They realise the importance of motivating others to have similar experiences, even creating new approaches. In general terms they are an excellent role model!

The expected levels of attainment as students progress through the curriculum is that on completion of the Common Foundation Programme students will function at the level of participation and on completion of the Branch Programmes students are expected to function at the level of internalisation. It is in the interrelationship

between elements of the educational philosophy, the levels of attainment, the taxonomy categories and course outcomes referring to critical thinking that issues of internal inconsistency start to emerge. For example, one can argue that an implicit covariation exists between the categories of the experiential taxonomy and cognitive levels akin to Bloom's Taxonomy of Educational Objectives (1956). Aspects of exposure and participation when viewed as the acquisition and understanding of information for example, correlate with aspects of knowledge and comprehension. It is not, however, until one reaches the level of dissemination that indicators of the higher cognitive levels commensurate with critical thinking as described previously appear, in the form of analysis, argumentation, and the generation of alternative possibilities. There thus exists considerable incongruence between the expected levels of attainment on the experiential taxonomy, particularly in respect of the CFP and one of its specific aims, namely:

> " To develop skills in critical thinking and research awareness that underpin nursing practice" (p.34).

The contradiction in aims is that, on one hand students are only expected to attain the level of participation on the experiential taxonomy at the end of CFP, whilst on the other hand students are also expected to have developed critical thinking skills at the same point. Additional issues arising are that although the curriculum overtly values critical thinking, it does not specifically describe or define critical thinking as a basis for evaluating aim achievement, nor is critical thinking taught as a discrete entity.

3.5 Assessment Strategies

The curriculum operates a system of continuous assessment focusing upon theoretical assignments and continuous assessment of clinical practice throughout the CFP and Branch Programmes (see appendix 1). Reference to cognitive skills and critical thinking is made in the criteria for grading of theoretical assignments as follows:

1. Evidence of cognitive skills: application, analysis; synthesis, evaluation.
2. Integration of theories and principles from relevant disciplines; evidence of depth of knowledge.
3. Evidence of wide reading. A competent academic literary style.
4. Critical evaluation of research and current literature with accurate referencing.
5. Logical development of argument.
6. Neatly presented within 10% of prescribed length.

In the case of practice assessment a system of combined experiential taxonomic outcomes and expected achievement indicators is used throughout the CFP and Branch Programmes. An example of such outcomes and achievement indicators is as follows:

Outcome Required

Conduct an holistic and comprehensive assessment by achieving the following indicators:

1. Competently utilise the nursing process in nursing practice.
2. Competently apply a model/theory for nursing within the assessment.
3. Utilise assessment rating scales where applicable.
4. Conduct an accurate holistic patient/client assessment.
5. Appropriately summarise, report and record the assessment data.
6. Recognise and appropriately respond to the patient's/client's verbal and non-verbal cues.
7. Sensitively involve patient/family in the nursing assessment.

The range of practice outcomes and indicators do not include specific reference to critical thinking although phrases such as: "demonstrate self awareness", "appraise and record effectiveness of care" and "suggest methods by which care practice may

be improved", may be associated with metacognition, evaluation and the consideration and generation of alternative possibilities.

Finally, the curriculum implementation is underpinned by means of the following teaching and learning methods (Table 3.5.1.) many of which are congruent with literature on critical thinking teaching strategies (Meyers, 1986; McPeck, 1990; Paul, 1991).

Table. 3.5.1: Summary of Teaching and Learning Strategies.

Seminars	Self evaluative practice	Experiential workshops
Discussion groups	Tutorials	Specialist workshops (by therapists)
Project work	Problem-solving groups	Peer group activities
Care studies	Case studies or histories	Client participation
Debates	Contract learning	Gaming

CHAPTER FOUR

General Review of Methods in Approaching the Examination of Critical Thinking

4.1 Introduction

This chapter focuses upon decisions relating to the central task of this work, which was the development of an appropriate design and instrumentation that would evaluate the impact of a Project 2000 Common Foundation Programme's effect upon the critical thinking abilities of a group of student nurses. The research task was to capture valid evidence of critical thinking in student nurses' reasoning in action and, as a result of the CFP curriculum, that incorporated a more qualitative perspective than previous studies examining the same construct within a nursing context. The chapter will, thus, present an overview of the instruments chosen and designed in order to address the research purpose over four phases of data collection spanning the CFP programme.

The importing of models from medical decision-making research was thought inappropriate because of the propensity of such models to use problems which are highly structured, complete and involving right answers (Barrows & Feltovich, 1987). Nursing problems, however, tend be less clear, unenduring and ambiguous with few single correct outcomes. Given the nature of the research questions, the discussion regarding the role of logic in critical thinking and the inconclusive nature of previous empirical evidence (chapter 2) a decision was made to combine a simulation mediated approach to elicit concurrent verbal reports of student nurses' domain-specific reasoning, with an existing instrument designed to measure critical thinking.

Concurrent verbal reports or think aloud techniques are common methods of data collection in research on the cognitive processes people use to solve problems or

make decisions (Anderson, 1987; Montgomery & Svenson, 1989; Ericsson & Simon, 1993). One of the original intentions of this research was to understand the thinking of experts so that others could be taught similar strategies and thus facilitate more effective decision making for the many. The technique involves participants thinking aloud while making a decision related to a cognitive task. The resulting verbalisations are recorded and transcribed. The transcriptions are then analysed for aspects of the data relating to: information that the reasoner attends too, the way the data are clustered, the knowledge used, the hypotheses activated, and the heuristics employed to combine information and make decisions (Corcoran-Perry & Narayan, 1995).

The overall methodological perspective underpinning the study is one of triangulation that combines positivist and interpretative approaches for completeness (Knafl & Breitmayer, 1989). With regard to the interpretative component, although the data are predominantly qualitative in nature they are used inductively in the context of examining participants' performance of a behavioural construct and not the socially or ontologically constructed meaning of individual experience as seen in purely phenomenological approaches.

Previous attempts to measure critical thinking ability in nursing have predominantly utilised a psychometric approach involving pencil and paper standardised reasoning tests. Multiple choice formats are most widely used, because they fit well with the pragmatic constraints of many testing situations (Norris, 1990). Examples of such tests are The Watson and Glaser Critical Thinking Appraisal (1964; 1980; 1991) A Test on Principles of Critical Thinking (American Council on Education (ACE) (1955, Form F1-5), and The Cornell Critical Thinking Test (Ennis, Millman & Tomko, 1985). These and a host of other tools have been used in a variety of educational studies investigating critical thinking which McMillan (1987, p.5) divides into three categories:

1. Studies of specific instructional variables

2. Studies examining how entire courses may affect critical thinking

3. Studies investigating the impact of general programmes or the combined effect of many courses on critical thinking.

This particular study would fit into the second category, given that the Common Foundation Programme for Project 2000 courses is seen as an educational entity in itself with clear outcomes related to critical thinking.

The most widely used test of critical thinking, according to the literature reviewed to date, is the Watson Glaser Critical Thinking Appraisal (1964; 1980; 1991).The test's particular attractions concerning this and previous nursing studies are: the author's definition of critical thinking as applied to practice; its claims to measure critical thinking as a discrete general ability; the fact that some of its indices of critical thinking fit well with indices identified in this study's conception of critical thinking; its availability in the UK and the recent development of a fully anglicised version of the test (Watson & Glaser, 1991).

Form C of the test is said to achieve a broadly international frame of reference for the test content, thus reducing potential item bias. All American - English usage in test items have been replaced and the test reflects a series of scenarios familiar to the UK user. Given that this study aims to describe the impact of a domain specific programme of study on UK beginning nurses' critical thinking abilities, it was proposed that a measure of entry behaviour in general critical thinking ability would be required in the form of a pre-test utilising the Watson & Glaser Critical Thinking Appraisal. The next section outlines the historical development of the test and related issues.

4. 2 History of The Watson-Glaser Critical Thinking Appraisal.

The Watson - Glaser Critical Thinking Appraisal (1991) has a history of development and refinement spanning over half a century. The precursor to the current test was developed by Watson (1925) as a measurement of Fair-Mindedness. Glaser (1937) revised and modified this extensively for use in "An Experiment in the Development of Critical Thinking." Originally forms Ym and Zm aimed at differing age ranges comprised 100 items divided into five subtests identified as indices of critical thinking. Each subtest focused on specific cognitive skills as follows:

Inference; (Evaluating the validity of inferences drawn from a series of factual statements)

Recognition of assumptions; (Identifying unstated assumptions or presuppositions in a series of assertive statements).

Deduction; (Determining whether certain conclusions necessarily follow from the information in given statements or premises).

Interpretation; (Weighing evidence and deciding if generalisations or conclusions based on the given data are warranted).

Evaluation of Arguments. (Distinguishing between arguments that are strong and relevant and those that are weak or irrelevant to a particular question at issue), (p.3).

The authors attest to the neutral and controversial nature of the item contents, citing studies showing that " strong attitudes, opinions and biases affect some individual's ability to think critically." (Sherif, Sherif & Nebergall, 1965; Mitchell & Bryne,

1973; Jaeger & Freijo, 1975; Jones & Cook, 1975.), (p.4). Examples of subtest content for form C items are:

Inference - (Efficacy of teaching strategies; maintenance of a free press; use of community land for commercial gain)

Recognition of Assumptions - (Availability of resources; educational resources; energy shortages; benefits of international co-operation; logical argument; fiscal prudence.

Deduction - (Power of convictions; benefits of literature; efficacy of vaccines; relationship between educational philosophy and resources; patriotism and radicalism).

Interpretation - (Sales techniques; educational statistics; political censorship; dreams as a form of communication; accident statistics; outcomes of teaching strategies).

Evaluation of Arguments - (Hypothetical weaponry; Nationalisation of industry; Agricultural policy; Environmental issues; Government spending).

Forms Ym and Zm were replaced in 1980 and currently the test exists in forms A, B, & C. Form C is the Anglicised version, and the 100 items is now reduced to 80 distributed throughout the five subtests.

4.3 Questions of Reliability and Validity

The reliability of the Watson-Glaser Critical Thinking Appraisal has been assessed in three ways: estimates of the tests internal consistency, the stability of test scores over time and the correlation between scores on alternate forms (Watson & Glaser, 1991). The degree of internal consistency was measured by calculating split-half reliability coefficients. According to the authors the usual method of correlating responses to alternate items could not be employed, due to the fact that groups of questions are associated with the same passage of text, and therefore not truly independent. For this reason the construction of the split-halves involved ensuring that items related to a given passage had to be kept together, so avoiding the prospect that items from any one subtest were not allocated unevenly to the two halves. Eventually all items across the complete item set for each form were allocated and all subtests represented in each half. This was achieved for example with form A by splitting the 16 items of the inference subtest thus;

> Items 1 - 10 (referring to the first two passages of the subtest) included in the first split-half scores.
>
> Items 11 - 16 (referring to the third passage on the subtest) included in the second split-half scores.

The same principles were used in the allocation of test items for form B and C and scores for items on each of the halves were totalled separately. The resulting summed scores were correlated, and the coefficients obtained corrected for test length using the Spearman- Brown formula. Split-half reliability coefficients were calculated for Forms A & B from a number of norm groups. Coefficients range from .69 to .88. Reliability of the more recent form C has been estimated from two sets of UK data comprising 267 and 111 administrations. The split-half coefficients of .87 and .88 respectively confirmed the authors' view that form C maintains the high standards demonstrated by other forms of the Watson - Glaser critical Thinking Appraisal (WGCTA).

The stability of scores for forms A and B over time was evaluated by administering the test twice to a group of students (N=96), with a three month interval between administrations. The means and standard deviations obtained were virtually identical for the first and second administrations (Watson & Glaser, 1991).

First Administration - Mean = 57. 4; Standard Deviation = 8.1

Second Administration - Mean = 56 . 8; Standard Deviation = 8.4

The correlation between responses of both administrations is .73 which the authors claim reflects ' ...an acceptable level of stability of the measure over time." (p.52). Finally, the authors claim that the reliability estimates reported are consistent with those observed for total test scores of the earlier forms Ym and Zm editions of the test (Equivalency). They conclude that these are sufficiently high to warrant use of the WGCTA for group administration and research studies.

4.3.1 Validity

Watson & Glaser (1991) discuss validity in relation to four sources of information namely:

Face validity;

Content-related validity;

Criterion-related validity;

Construct - related validity.

Face validity refers to whether or not a test looks valid to candidates, administrators and others, that is, does it ' look right' . If the test content does not appear relevant to candidates, particularly adults, then a lack of co-operation may ensue, regardless of the actual validity of the test. The author's claim that the WGCTA has high face validity because its relevance to management and decision making roles are easily understood by participants. Also, the operations and processes required to complete the subtests reflect abilities which are valued and appreciated presumably by administrators and individuals aspiring to these roles. They further their case by

claiming that the WGCTA has been a major test in the UK for many years even though until 1991 the test was distinctly American in its English usage and cultural emphasis. Despite this the test in its earlier and now its anglicised version has gained recognition by many leading organisations as a tool in management selection procedures. Implicit in this position then is the proposition that, unless a test appears to candidates and administrators to test what it claims to test, its validity will be affected. This may also suggest that when the test is used in situations when participants or administrators are not aspiring to or measuring management or decision making roles, and who may not understand or appreciate the operations and processes required to complete the subtests, then co-operation may not be forthcoming. No reference is made in this context as to the test's face validity in relation to educational purposes. Watson & Glaser (1991) do, however, stipulate that appearance and graphic design are no guarantee of quality and face validity cannot be considered a substitute for objectively determined validity.

4.3.2 Content Related Validity

In order to demonstrate the relationship between the test items and the expected manifestation of critical thinking ability, Watson & Glaser (1991, p.55) suggest that the individual's response to the behaviour area in question is more relevant than the apparent relevance of the test item, because the actual processes employed by the candidate undertaking the test may not be evident from mere inspection of the test. The Watson and Glaser Critical Thinking Appraisal, thus, is concerned primarily with the processes required in evaluating the test passages rather than in the specific scenarios depicted. Content validity is achieved by careful analysis of the domain to ensure that "...all the important features are covered by the test items, and that they are appropriately represented in the test according to their significance." Emphasis is also placed on avoiding unbalancing the test by overloading items representing one particular aspect of behaviour, careful attention to literary demands and effects of

speed on scores. Discussion of this issue in the test manual is somewhat generalist and gives little indication of content related construction.

4.3.3 Criterion Related Validity

The Watson - Glaser Critical Thinking Appraisal's concurrent criterion related qualities have been validated against a number of ability and achievement tests such as the Stanford Achievement Test in Language and the Otis-Lennon Mental Ability Test . Predictive validity, it is claimed, has been demonstrated to some extent by predicting performance of USA police academy recruits during their academic pre-service training. The authors, despite the longevity of their test and wide usage, suggest that establishing predictive validity is hampered by time constraints, and studies lasting many years would be required for this purpose. Concurrent validity is claimed to be a sufficient indicator in certain instances, because performance measures may be taken for a group for whom criterion data are already available. Thus, test scores of existing employees can be compared to work performance, and applied, for example, to "...recruitment or selection testing". The authors, however, offer no evidence in relation to this particular aspect of validity.

4.3.4 Construct -Related Validity.

Evidence for this type of validity is taken from data arising from several sources. Data relating to instructional settings in which programmes designed to improve critical thinking, as reflected in WGCTA test scores, has been used to establish its construct - validity (Sorenson, 1966; Fogg & Calia, 1967; Agne & Blick, 1972; Burns, 1974; Litwin & Haas, 1983;). Another major validation criterion of a test of this nature is said to be age differentiation. When an ability such as critical thinking would be expected to increase with age and experience during childhood and adolescence, it can be argued that a valid test would reflect this in increased scores, as the authors claim this test's scores do. Should test scores of this nature fail to

increase with age then "...in all probability that test is not a valid measure of the abilities that it is intended to sample" (Watson & Glaser, 1991, pp. 60-61). They conclude this issue, asserting that age differentiation when applicable, is a necessary but not a sufficient condition for construct-related validity. The proposition here appears to be age differentiation during childhood and adolescence, with no reference to age differentiation and test performance in adulthood.

High correlates between WGCTA scores , measures of general intelligence and other ability measures, e.g. Otis, Otis-Lennon Mental Ability Tests, Californian Test of Mental Maturity, and Miller Analogies Test are said to contribute to construct validity. The above correlations range from .43 to .75 and although the WGCTA has been found to correlate with general intelligence, factor analysis suggests its overlap as a construct is incomplete (Watson & Glaser, 1991).

Watson & Glaser claim that factor analysis of WGCTA subtests with other measures of intelligence suggest that the test is measuring a dimension distinct from that of overall intellectual ability. Data from the work of Landis, (1976), and Follman, Miller & Hernandez, (1969) are said to support the notion that the WGCTA is measuring a discrete and unidimensional aspect of ability, and therefore provides further evidence of its internal consistency. The scores on the subtests are also purported to be related to the total score. These correlations range from:

- .56 - .79 for forms Ym and Zm
- .50 - .69 for forms A and B combined
- . 54 - .77 for form C

Independent reviewers of the Watson-Glaser Critical Thinking Appraisal forms A & B raise several cautions regarding reliability and validity of the test. Helmstadter (1985, p.1693) suggests the construct validity of this trait and its measure has not been explored sufficiently thoroughly or systematically. Although items have face validity and have been subjected to appropriate psychometric criteria, forms have

been equated by standard procedures, and a wide variety of reliability indexes computed using different groups and methods. Reliability remains adequate but not "outstanding", and is not yet as high as one "... normally expects for cognitive tests." Moreover, Helmstadter suggests the reliability problem may stem from the fact that four of the five subtests are composed of items comprising only two alternatives. However, it may also arise from the substantial judgement component in the "inference" subtest which appears to relate to the amount of evidence required to convince the participant of an argument, as opposed to their ability to ascertain the validity of an inference. McPeck (1981) makes a similar critique, questioning the internal logic of questions and claiming that the 'inference' item responses are inappropriate. Inferences should be judged valid or invalid, not true or false. This confusion is further compounded by the subtest instructions inferring the unusual notion of degrees of truth or falsity which could normally be more closely associated with a proposition as opposed to an inference. Further weaknesses regarding construct validity and normalisation data were suggested by Abo El-Nasser (1978) and McPeck (1981) but these refer to forms Ym and Zm. Morante & Vlesky, (1984) further revealed that the limited information on the reliability, norms, and other statistical data made adequate evaluation of results problematic. Berger (1985) pondered the difficulty in ascertaining which items were neutral and which controversial. The only explanation proffered by the authors is that neutral items for example, deal with the weather, scientific facts or experiments. Conversely, controversial items deal with political, economic and social issues, which frequently provoke stronger feelings.

Berger (1985) raises a caution regarding equivalence of forms, highlighting the authors' claim as to the "close correspondence" between Forms A & B. Berger asserts the authors claim, that the relationship between Forms B and Zm and Forms A and Ym is "highly likely to extend to the relationship between Forms B and Ym and A and Zm. Direct comparisons of the latter sequence had not been made

however. Furthermore, the close correspondence referred to is a correlation of .69 between forms B & Zm and .78 between Forms A & Ym. Whether this represents sufficiently "close correspondence", Berger suggests, is a matter of judgement as is the use of phrase "highly likely" in the light of unavailable evidence. Similar information in relation to Form C is currently unavailable, although a series of UK norms are shortly to be published. Finally, in relation to the WGCTA's ability to test critical thinking as a discrete ability. McPeck (1985) claims that although Watson & Glaser report high correlations with general intelligence, norming data, fails to provide cases with an inverse relationship between intelligence and critical thinking. In light of this, the conception of critical thinking as a general ability that may be measured independently of content and knowledge of the subject remains questionable, as does the tests discriminant validity.

4.4 Summary of Issues Relating to the Watson & Glaser Critical Thinking Appraisal

In summary, although many reviewers judge the WGCTA to be well constructed for use with groups (Crites, 1975; Helmstadter, 1975; Modjeski & Michael, 1983; Berger, 1985) and the literature reveals wide usage in relation to groups of nurses (Matthews & Gaul, 1979; Ketefian, 1981; Gunning, 1981; Berger, 1984; Tiessen, 1987; Bauwens & Gerhard, 1987;Gross, Takazawa, & Rose, 1987; Sullivan, 1987; Fleeger, 1987; Lynch, 1988; Kintgen-Andrews, 1988; McLaughlin, 1988; Brooks & Shepherd, 1990; Pardue, 1987) its utility as the sole measure of critical thinking ability in studies is questionable. McMillan (1987) asserts that there may be sufficient technical limitations to significantly weaken research using this particular measure, and it appears unlikely that a study designed to change one or several environmental conditions, among many possible influences will reflect differences on the sole basis of WGCTA scores. He also contends that when the WGCTA is used as the dependent measure, the finding of non-significant differences is likely. Also if

students begin a specific course with high scores on a measure of critical thinking, it is unlikely that an intervention will statistically improve their score. McMillan (1987) further believes that researchers should not rely on a single measure of critical thinking particularly when of a psychometric nature. Dressel & Mayhew (1954, p.36) similarly suggested that a "...'test" of critical thinking with "correct" answers is antithetical to genuine critical thought", and implies that any evaluation of this nature is likely to be inadequate. The limitation of using the WGCTA as a unitary instrument of measurement is further alluded to by Berger (1985) who recognises that essentially the WGCTA appraises critical thinking through reading. The issue of whether people taking a similar test of critical thinking through listening would obtain comparable scores is not discussed. Norris (1985, p.42) addresses these concerns also positing that:

> " Most critical thinking tests do not provide information about what the examinee is thinking. That is, they provide only the conclusions to thinking processes, not the processes themselves."

Furthermore, Norris (1990) believes that what is required are explicit indications of individual's reasoning in order to differentiate between deficiencies in thinking and differences in background beliefs and assumptions. Moreover, Beck et al., (1992) attest to the need for development of a content-specific tool which will measure critical thinking in nursing and such a tool would require a set of multiple measures of critical thinking. There appears, thus, a need for an approach which combines multiple measures of critical thinking which would facilitate triangulation of results for a more complete representation of subject reasoning process and outcomes. For example, measures of student - teacher perceptions of critical thinking, criteria for judgmental analyses of reasoning behaviour, and locally devised instruments that are pertinent to the reasoning domain. Such instruments would need to address Norris's concerns and illuminate the characteristic processes involved in beginning nurses' domain specific professional reasoning.

Another point which was particularly pertinent to this study design is the fact that nurses acquire data upon which their reasoning and clinical decisions are based upon information from a variety of sensory modalities and not just written material. Examples of these are: hearing, seeing, feeling, smelling (Auscultatory, visual, tactile & olfactory stimuli). Any instrumentation designed to facilitate the above issues would need to reflect aspects of such sensory modalities.

In summary, the literature reveals that, although numerous studies have been conducted in relation to nurses critical thinking, they appear exclusively to adopt a psychometric approach. None identified to date have attempted a more qualitative approach to identify the natural processes of nurses' critical reasoning, or why the body of evidence regarding pre and post registration educational outcomes may be inconclusive regarding the existence or extent of critical thinking. A suitable alternative methodology that would address these shortcomings, therefore, had to be developed for this purpose.

4.5 Examining Alternative Methods for the Appraisal of Critical Thinking

Given the nature of nursing practice and the scope of data acquisition upon which practice is dependent, plus the nature of the above methodological problems, it seems conceivable that if one intends to examine the processes and products of beginning nurses cognition from a non-physiological perspective, then the processes and products of beginning nurses' cognition must in some way be made public, and captured for analysis. One method for facilitating the expression and recording of subjects thinking as verbal data, is that of the 'think aloud technique' (Newell & Simon, 1972; Ericsson & Simon, 1984). This was the method of choice for the qualitative data collection phases of the study design.

Oral discourse and Socratic teaching methods have a long history of being an acceptable way of capturing an individuals reasoning. Coles & Robinson (1989, p.9)

contend that " Since linguistic communication is the primary vehicle of education, most teaching programmes centre their attention on language. Though thinking is not all done with language, that is how it is usually conveyed, recorded and taught." Through oral discourse people are said to impose order on the randomness of perception which helps make sense of themselves and the world. Even those who primarily work within non-linguistic sign systems, for example painters, musicians, architects and mathematicians, articulate their intentions and describe their methods through oral discourse (Marzano et al., 1988). At a more generative level Van Dijk (1980) claims that all discourse arises from specific intentions, that is, they represent the thought behind the message. Schlesinger (1971) also maintains speech reflects an individual's thinking, asserting that the intentions behind utterances are the kernels of creation. Even when speakers may be unaware, their speech reflects their intentions. McPeck (1981, p.63) also appears to support the interrelationship between speech and cognition, by stipulating that "...we must assume that a person's utterances and behaviour are the most direct evidence of what he is thinking or has thought." The value of data obtained from think aloud methods is founded on assumptions about verbal reports as data as summarised below by Ericson & Simon (1984; 1993):

1. The cognitive processes that generate verbalisations are a subset of the cognitive processes that generate any type of recordable response or behaviour;
2. Human cognition is information processing, a sequence of internal states successively transformed by a series of information processes;
3. Information recently acquired and currently being attended to is directly accessible as verbal data, using think aloud methods.
4. The instruction to verbalise concurrently does not alter the course of subject's cognitive processes. (Reactivity)
5. The instruction to verbalise does not significantly alter the speed of task performance.

Ericson & Simon (1993) also propose a model of verbalisation comprising three levels of verbalisation with associated intermediate processes.

Level 1 - Simply the verbalisation of covert articulatory or oral encodings. At this level, there is no intermediate processing and no special effort is required from the subject in order to communicate his thoughts (talk aloud).

Level 2 - Involves description or rather explication of the thought content. Verbalisations are assigned to this level when they bring no new information into the focus of the subject's attention, but only explicate or label information held in a compressed internal format (information reception). Further encoding may be required as in the case of explicating information not isomorphic with language such as smells. Subjects verbalising at level 2 can be expected to take longer to complete a task, than a subject not verbalising. However, Ericson & Simon (1993) hypothesise such recoding does not alter the structure of the process for performing the main task.

Level 3 - This level of verbalisation requires the subject to explain his thought processes or thoughts. An explanation of thoughts, ideas, hypotheses, or their motives is not merely a recoding of information already present in short term memory, but requires linking this information to earlier thoughts and information attended to previously. Level 2 does not involve such interpretative processes. (Integration of incoming information to previously internalised knowledge structures).

4.6 Verbal Reports as Data

The last fifteen years has marked a notable increase in the use of verbal data to study cognitive processes in various areas of psychology, education, cognitive science and nursing. Concurrent and retrospective verbal reports are now recognised generally as appropriate sources of data on subjects' cognitive processes in specific tasks (Anderson, 1987). The popularity of the method, however, has waxed and waned. The verbal explication of thoughts, that is, 'thinking aloud' was used early this century by Claper`ede (1934) and has been used extensively since that time in the information processing approach to cognition and other paradigms ( DeGroot, 1965; Newell, 1966; Newell & Simon, 1972; Gagne & Smith, 1962). Claper`ede considered it a credible procedure since it involved neither introspection nor retrospection. However, it did have certain drawbacks in that it required training and some subjects did not speak during the most interesting and active moments of problem solving. Neisser (1967) criticised the procedure on the grounds that speech is perforce sequential, and using speech to reports problem solving processes may make it appear or become sequential, when it may actually be operating on many levels simultaneously. Similarly McGuire (1976) cautioned that thinking aloud may make problem-solving appear (or even be) more orderly than it is.

Ericson & Simon (1980) suggest that concern for understanding the course of cognitive processes has revived interest in discovering means to improve the quality of observations of behaviour to reveal in greater detail intermediate stages of these processes. One such means is the use of verbal reports as data, particularly, in the form of verbal protocols for analysis. From a psychological perspective a protocol refers to a blow by blow record of an individual's behaviour whilst engaged on a cognitive task, as a source of psychological data (Bryne, 1983). The recorded protocol often consists of a stream of verbal comments constituting a part of a problem path which reflects the individuals underlying reasoning in relation to the task at hand. The verbal report of reasoning is now observable and therefore

amenable to analysis. This conversion of thought to verbalisation is achieved by employing the technique of 'thinking aloud', a process which Benjafield (1969) refers to as the direct output of inner speech. Crow et al. (1980) further portend that verbalisation in this context permits observation of the processes of decision making. Thinking aloud may, thus, be conceived in part as introspective and can be found in the three categories of Radford's (1974) taxonomy of introspective methods as follows:

Thinking aloud;

Self - Report;

Self – Observation (Introspection proper).

Radford (1974) refers to Tichener, an introspectionist who believed that inner experience could be observed, just as behaviourists would observe an organism's behaviour. Moreover protocol analysis is closely associated with the types of fine-grain observations of behaviour used successfully by the ethnologist (Tinbergen, 1963) and treats verbalised mental events merely as pieces of behaviour, not as forms of explanation for such behaviour.

An important distinction, then, is that protocol analysis examines patterns and sequences in a continuous stream of behaviour (Byrne, 1983) but does not attempt to explain the processes involved. Ericson & Simon (1993) clarify this issue by suggesting that thought processes can be described as a sequence of states. Each state contains the end products of cognitive processes. Examples of such processes are information retrieved from long term memory (recall), information perceived and recognised (interpretation) and information generated by inference (extrapolation). The information in a state is relatively stable and can, therefore, be input into a verbalisation process and reported orally. However, the retrieval and recognition processes delivering the end products, that is the information, to attention cannot be reported.

The results of protocol analysis according to Linde & Labov (1975), shows the rules of linguistic discourse, though Bryne (1982) believes they may also be treated as showing the form of representation of the information. Either way, the analysis is one of describing pattern regularities in a stream of (verbal) behaviour, from which analysts may infer meaning or performance.

Ericson & Simon (1993, p.217) believe "...recorded verbalisations can be conceived of as data." They caution, however, the proviso that one does not assume that the verbalised description accurately reflects the internal structure of processes , or of heeded information, or that it has any privileged status as a direct observation. They further stipulate that models that can regenerate the verbalisation can be constructed and evaluated without such assumptions. This may be taken to mean that the method used for analysing patterns of verbalised content, will not be used to infer how the information was internally formulated in order to produce the verbalisation.

Although the use of verbal reports as data is widely used and supported, it does have its critics. Modern psychology has been vague regarding the uses of verbalisation produced by a subject along the route to a response or solution. Even more dubious has been the status of subject responses to experimenter probes, or retrospective answers to questions about prior behaviour. These types of verbal behaviour are often dismissed as variants of the often discredited process of introspection (Nissbett & Wilson, 1977). This results from the general argument that introspection has uses in the discovery of psychological processes but is worthless for verification.

Much of the scepticism surrounding aspects or introspection arise from disagreements over definition and tense. The previous description of protocol analysis by Byrne (1983) refers to verbalising whilst on a cognitive task. This indicates present tense and is recognised as concurrent verbalisation. By contrast,

Byrne believes analysing the content of verbal reports collected retrospectively, in order to explain other behaviour, is not regarded as protocol analysis. For this reason Burgoyne's (1975) use of the term protocol analysis in his "inductive analysis of content" is deemed inappropriate. Burgoyne asked subjects to think aloud while coming to evaluative judgements about their learning experiences. This is clearly an example of posteriori retrospection that brought into question the reliability of the data. Nissbett & Wilson (1977, p.251) echo this sentiment and note that "...removal in time from the actual occurrence reduces the accuracy of the report." The potential effect of such events is that subjects may reconstruct partially forgotten material, so rendering the data unreliable. Ericson & Simon (1993), however, report a change in their views of the reliability of retrospective reports in certain instances, in light of continued experience in eliciting retrospective reports, and much - improved instructional procedures. In studies related to individuals reasoning Fonteyn et al. (1993) suggest the possibility of obtaining fuller descriptions of the reasoning used during a particular cognitive task, by augmenting concurrent think aloud data with retrospective data from subsequent interviews. Kuipers et al. (1988) also advocated this approach contending that, while concurrent think aloud protocols are sensitive to the subject's natural control and flow of knowledge in relation to problem solving, it is insensitive to the limits of knowledge stored and its application to problem solving. Asking the subject to respond to post protocol questioning related to the problem at hand overcomes this deficit and provides a richer account of subject reasoning. Joseph & Patel (1990) concur with this approach claiming that although think aloud protocols provide rich data about concurrent reasoning, and changes in subjects' representation of a problem, they are limited to providing no more than global information about subjects' processing.

Similarly, although guided interviews provide detailed data about subjects' representation in memory and inferences based on knowledge domain, they are limited in the volume of information provided about the problem solving process.

The conclusion to be drawn, then, is that studies combining both methods may provide the fullest description of subject reasoning and decision making. Combining concurrent verbalisation with retrospective data has been used in a variety of studies investigating clinician's problem solving and reasoning strategies (Kuipers et al., 1988; Grobe et al., 1991; Fonteyn & Fisher, 1993; Fonteyn & Grobe, 1994).

The above studies, among others, have developed and utilised several approaches to data collection. By far the most common of these is that of client simulations (Grier, 1976; Barrows et al., 1982; Ferrand, Holzemer, & Schleutermann, 1982; Kassirer, Kuipers, & Gorry, 1982; Putzier, Padrick, Westfall, & Tanner, 1985; Freidman, Prywes, & Benbasset, 1989; Sims & Fought, 1989). The equivalency of client-simulations to real-life situations have been supported in health care research (Holzemer, Resnik, & Slichter, 1986; Holzemer & McLaughlin, 1988), although this needs to be viewed against a background of inconclusive evidence as to the effectiveness of simulation as an educational tool (Megarry, 1977; Winer & Vasquez - Abad, 1981; Barnett, 1984).

Simulations of the professional practicum utilising a variety of instruments have been developed to facilitate domain specific learning and data collection. Examples of these instruments are: written case studies; 3-D models; computer simulations; videotaped vignettes; role play; multi-media approaches and simulated patient cases.

Simulations are particularly relevant to health professional research and education because they are able to parallel reality when constructed well (Miller, 1987). They enable investigators to approximate the clinical practicum while controlling for possible variables found in real-life situations (Fonteyn, 1991). Simulations can convey to the learner / subject an understanding of the complexity of a system that may be composed of many simultaneously-acting processes, in a controlled manner

(Stead, 1990). Simulations can be designed to facilitate the application of knowledge to situations without the attendant risks of client harm. Kimmel (1988) similarly warns of the ethical dilemmas facing researchers regarding the preservation of "pure" data, and the prospect of observing unfavourable practice without interference in actual practice. Simulations in this context can overcome this potential dilemma and facilitate the acquisition of data reflecting truer replicas of performance. Furthermore client simulations provide opportunities for participants to deal with the consequences of their actions, thus facilitating valuable learning insights without actual cost to the client or the learner or respondent. Finally from a research perspective simulations can provide observable evidence of performance and standards. Miller's (1987) taxonomy of simulation types (table 4.6.1) reflects the 'fidelity' of each type and provides a useful tool for researcher / educationalist choice. The level or degree of fidelity however, in this context, refers to how true to life the simulation can be to accomplish its objectives, given for example, that professional accountability is not evident and the imposition of real-time unpredictable extraneous variable is absent.

Table 4.6.1 Miller's Taxonomy of Simulation Types.

Type	Example	Fidelity	Typical use	Example of use
Written simulation	Paper and pencil, latent image.	very low	Teach knowledge, assessment.	Patient management / diagnosis
3 - D models	Mannequins	Low	Demonstration	Pelvic examination.
Computer simulation	Microcomputer	Medium	Teach cognitive skills / problem solving assessment.	Clinical Management
Multi-media	Computer linked videodiscs	High	Teach complex skills.	Physiological diagnosis and management.
Simulated patient.	Trained actor	Very high	Teach inter - personal skills	Simulated mother.

Miller, (1987 p.36).

The conclusions drawn from the literature were that an alternative method would need to be developed in order to:

Facilitate student nurse reasoning about a suitably complex aspect of nursing practice;

Provide a stimulus as the basis for the respondents' cognitive task;

Combine concurrent and retrospective subject data;

(Levels 2 & 3 Verbalisation)

Simulate a nurse/client interaction;

Facilitate the description of student nurse reasoning in relation to eliciting evidence of critical thinking;

Be suitable to learner's level of knowledge.

4.7 Development of instruments and procedures for data collection

The following section deals with the development and piloting of methods and technology to satisfy the above objectives. Questions surrounding the above are

addressed by recourse to the relevant literature and by issues arising out of the pilot study (n = 10) conducted to develop and test the data collection procedures.

Data collection design, pilot study, implementation and modification of data collection methods: instrumentation for phases 2 & 3.

For phases two and three the aim was to determine the most effective method of producing high quality and valid qualitative data consistently, in order to achieve the purpose of this particular investigation. This required the development and testing of suitable data collection methods. Given that concurrent and retrospective verbal protocols were required the appropriate literature was reviewed. This revealed several issues that would need to be addressed in the development and application of the qualitative instrumentation. These issues are portrayed in the following instrumentation related sub-headings:

- 1. Factors that facilitate or inhibit the processes of thinking aloud.

- 2. The range of think aloud instrumentation, e.g. videotaped simulation, written case study, or other audio visual media, that could provide appropriate data.

- 3. The completeness of the verbal reports as a record of concurrent task-oriented student nurse reasoning about health status, and the role that prompting plays in this.

- 4. Procedures used to complement the concurrent protocols to facilitate as complete a description of student nurse critical reasoning about health status as possible.

- 5. The technology required to collect verbal data, and its appropriate employment.

- 6. Respondents' instructions for thinking aloud.

- 7. Evaluation of instrumentation for phases 2 & 3.

4.7.1 Factors that facilitate or inhibit the processes of thinking aloud.

Asking a subject to make their thoughts explicit by verbalising them or 'thinking aloud' should not unduly affect the performance of cognitive tasks, providing the information required is appropriate to the task (Ericsson & Simon, 1980; Bryne, 1983; Henry et al. 1989; Norris, 1990) and the respondent wishes to participate in the task of verbalising. Problems of self - consciousness and cultural restraints, e.g. the encouragement to keep your thoughts to yourself (Lichtenstein, 1982), may be overcome by introducing subjects to the concept of thinking aloud in a light-hearted and non-threatening manner prior to the data collection proper. Previous researchers have used simple mathematical problems e.g. multiplication of several numbers, water - jug problems and mental paper folding as a means of familiarising subjects to the concept of thinking aloud. Hayes (1982, p.86) supports these exercises by claiming 'subjects who give more than one protocol say the procedure becomes more comfortable with practice.' Ericson & Simon (1993) also point to the importance of subjects conducting 'warm up' tasks positing that this appears to eliminate silence due to misunderstandings of the instruction to think aloud. Given that nursing behaviour in the main results from data acquired via sensory modalities and encoding of visual stimuli in particular, the use of visual scenes appears applicable in that they may more accurately reflect everyday practice environs. The author proposed to use videotaped scenes of commonly experienced events as a means of encouraging respondents to think aloud. The current choices of videotaped

subject matter are, firstly, a tennis match and, secondly, a form of silent traffic scene. The rationale for the former is that given the time of year (Wimbledon tournament) and the national popularity for this and other sports, It was envisaged that many individuals would have witnessed commentary of sporting events and, therefore, would have some idea of the type of things to say and when to say them. Secondly, the act of driving requires constant attention to situations and conditions which informs subsequent psycho-motor activities. Driving is also familiar to large numbers of the populace, so familiar, that many aspects of driving for many may, in some circumstances, have become so automated as to be undertaken subconsciously. Therefore, because driving has become such a routine daily activity for many, as has the recognition of traffic situations and hazards for pedestrians, merely explicating what they attend to during the scene should not pose great difficulties. The perceived outcome of this strategy is that respondents will practice thinking and talking aloud in a non-threatening environment which will facilitate an increase in comfort and a reduction in self - consciousness, thus, facilitating the acquisition of verbal data.

After conducting several pilot experiments the tennis match warm up video was abandoned. The researcher had overestimated the game's familiarity and following, particularly in a culturally diverse group, resulting in poor think aloud data from confused and reticent participants. The traffic scene worked well, however, even respondents who were not drivers participated well and continuous verbal data was forthcoming. A second warm up programme was sought using a similar scenario. This time, however, it was decided to include the additional cognitive load of incoming verbal data in preparation for the clinical simulation proper. Assistance was sought from the West Midlands Police training college and a suitable traffic scene with accompanying commentary was secured. A simple task was set and participants were asked to verbalise their task oriented reasoning concurrently. This exercise was

also successful and respondents verbalised comfortably and consistent levels of verbal data were forthcoming.

4.7.2 The range of think aloud instrumentation, e.g. videotaped simulation, written case study, or other audio visual media, that could provide appropriate data.

Client simulation was the instrument of choice given its designated high fidelity with regards to Miller's (1987) taxonomy, the aims of the investigation and conclusions drawn from the literature. A variety of methodologically similar studies have utilised either written case studies, interview/cross examination techniques, videotaped simulations or combinations of these approaches (Corcoran, 1986; Westfall et al. 1986; Kuipers et al. 1988; Grobe et al. 1991). None of these studies, however, focused on the concept of critical thinking. Written case studies were discounted on the grounds previously discussed as this would only perpetuate the measuring of critical thinking in reading and in light of the fact that nurses attend to far more divergent data in their clinical decision making. Three-dimensional models were also discounted on the grounds of expense and the difficulties anticipated in developing scenarios of sufficient cognitive complexity suitable to the early stages of subject education and experience at the time of data collection. The types available in most medical institutions are used predominantly for the practice of certain psycho-motor/clinical skills and the learning of anatomy and physiology. Their availability is somewhat limited in most institutions that could have resulted in the need to purchase a model solely for the study.

Computer simulations would need to be of the virtual reality calibre to reflect anywhere near the high fidelity of a client simulation. The availability of such programmes pertinent to the research topic negated their use. Human model simulations were considered for their very high fidelity but problems of availability of

suitable actors for the proposed number of data collection experiments, plus issues of standardisation and expense deemed this method unsuitable.

The possibility of using real patients during actual healthcare encounters was explored initially as a naturalistic alternative and ecologically valid instrument for examining concurrent professional reasoning. This approach raised the possible ethical dilemma of causing patient and respondent distress by the need to externalise respondents' thinking (Jones, 1989). This may be compounded by the nature of patient's health problems and the respondent's learner status. Greenwood & King (1995, p.908) disagree with this sentiment on the grounds that "...nurses already think aloud in front of patients, especially when explaining care rationales to clinical teachers." This begs the question as to the discrete nature of the care rationales and whether clinical teachers would expect and support learners in thinking aloud potentially distressing and confidential information in an essentially public learning encounter. In contrast, however, to their belief that thinking aloud in real practice is ethically sound, Greenwood & King requested that their nurse subjects selectively filtered any potentially distressing information from their verbal protocols. They defend this strategy by claiming that because the information was selectively filtered, it would thus be remembered and be made available for retrospective reports of reasoning in the absence of the patient. One question surrounding the validity of such a strategy however is, how might the respondent's decision making regarding what would constitute distressing information to an individual affect the primary reasoning processes and subsequent recall?

Given the arguments above, video-taped client simulations appeared to be the instrument of choice because of their designated high fidelity and ethical congruence. They also facilitated an array of alternatives from which to choose in the form of vignettes and a large stock of pre-recorded examples was available at the host institution. A cautionary note needed to be made at this point in relation to the

theoretical validity of non-interference between verbalisation and primary process and the potential effect a videotaped client simulation might impose on this. Russo et al. (1989) summarise the conditions for validity of this claim as follows:

1. Subjects report only the contents of short-term memory (STM).
2. Those contents are in oral form, i.e. coded as a string of phonemes.

This, thus, excludes tasks that require recoding from non-oral representations as in pictorial mode to an oral one which may draw on differing processing resources. Tasks such as the one envisaged for this client simulation will involve data in oral form and pictorial form, hence a degree of recoding will be necessary. Rehearsal of previously attended to information may also be a feature of the primary task, which can place a heavy burden on STM. Ericson and Simon (1993, p.249) warn that:

> "Interruption and suppression of rehearsal lead to a rapid loss of information from STM. Hence we would expect that prolonged attention to items in STM to allow verbalisation will be disruptive of tasks that impose loads on STM."

In order to reduce STM burden imposed by pictorial recoding, and loss of information in STM by suppression of rehearsal a question was posed to pilot respondents in the form of:

> " If you were gathering information from a client in an assessment situation, what would you do if you felt you have missed, misheard or forgotten a piece of information?"

In response to this all pilot respondents answered similarly, in that they would ask the client to recap information generally or ask them to repeat specific information. In order to parallel this strategy it was proposed that pilot respondents have control of a remote control facility. This would enable them to rewind the videotape should they experience high processing burdens or missed information. This theoretically should facilitate the rehearsal of previously attended to information, reduce burdens on STM and promote completeness of descriptions of respondent reasoning.

Once chosen, a particular videotaped vignette would provide a stable, consistent clinical scenario for repeated exposures. Choice of client simulation posed a degree of difficulty in considering the following variables:

Professional topic;

Type of scenario;

Length and complexity of simulation.

Many hours of viewing ensued and finally a pre-recorded videotape was found which seemed suitable for the study purpose. The videotaped simulation chosen focused on issues of individuals' health status. This was deemed pertinent to the study because of the changing philosophical emphasis within the project 2000 curriculum which advocates an individualised, community-based, health promotional approach to nursing in contrast to the previously hospital based, medically modelled approach to intervention and care. Health as a concept is sufficiently complex to require critical thinking when decisions are to be made in relation to individual's health status. The importance placed on health by individuals and its meaning, is subjective, multifactorial, changeable, directly determined by contextual considerations and, therefore, is not amenable to simple yes or no responses. Concepts of health and illness vary among different groups within a single society and between societies over time. Aggleton (1990) further points to the complexity of health related decisions positing that some people may be healthy according to some criteria but not according to others. These issues imply a degree of critical reasoning that extends beyond hypothetico-deductive models of reasoning used in theories of medical decision making, where even ill-structured patient problems have a reasonably stable endpoint in the form of a diagnosis (Barrows & Feltovich, 1987). When decisions are to be made about a client's health status and subsequent interventions they would need to be informed by professional, individual, and contextual frames of reference which render them complex, indeterminate, and worthy of complex reasoning.

Another relevant factor in choosing a health-oriented simulation is that of the broad conceptual changes in the project 2000 curriculum. Kenworthy et al., (1992) allude to the need for nursing to be health oriented rather than illness driven. The issue of health as opposed to health care is also central to recent World Health Organisation (1985) and British Governments Health of the Nation (1991) strategies which called for an end to the preoccupation with treating illness and a move towards improving the healthy span of life. The making of health related decisions will clearly become an integral part of the future nurse's role. The making of these types of decision require that the decision-maker contemplates the prospect of more than one justifiable answer. The quality of the decision or answer should not be predicated right, merely in the sense of truth, but on the quality of the justification in context. It is for this reason that health as a focus for describing beginning nurses reasoning strategies seemed a suitably complex topic that would act as a catalyst for critical thinking.

Issues of Reliability and Validity

The reliability of the instrument is predominantly viewed in relation to Ericson & Simon's (1993) Pertinence of Verbalisation to Cognitive Process criteria which include a relevance criterion, a consistency criterion, and a memory criterion.

The videotaped client simulation of choice was entitled " Whose Health is it Anyway?" The instrument comprises four vignettes of individuals in their natural social settings, discussing aspects of their lives and lifestyles. Each vignette lasts approximately 10 minutes and is supported by an accompanying narrative, giving additional information. The video is produced as an educational aid and commences with a discussion regarding the construct 'health' and its associated complexity. Each vignette concludes with a series of questions posed for the audience to stimulate reasoning. Given that this instrument is being used in part to facilitate the description of individual's reasoning in relation to a particular construct the following issues warranted consideration:

1. Will the respondent's verbalisations be pertinent to the cognitive processes. That is, will this simulation in conjunction with other instructions provide a consistent stimulus for respondents to reason about health status;

2. Will this simulation in conjunction with other instructions and equipment generate consistent volumes of verbal data.

The former issue relates to the*relevance criterion* and focuses on the relevance of verbalisations to given tasks. If, for example, all the observed verbalisations were irrelevant to the task pertinence could not be claimed. Newell & Simon (1972) attest to the fact that a priori task analysis will reveal what kind of information would be relevant to task performance. This issue also relates to nonveridicality of generated protocols (Russo et al., 1989). A protocol is nonveridical if it does not accurately reflect the underlying primary process. Nonveridicalities may include errors of omission, that is not reporting some thoughts or errors of commission as in the reporting of fabricated mental events. The very nature of the simulation and its intended educational purpose instilled significant confidence in its ability to achieve these aims. However, in order to augment instrument reliability in this context an added verbal instruction was devised in the form of:

> "I want you to imagine that you are in a nurse-client interaction. The client named Billy is claiming that he is perfectly healthy and does not require any advice. I want you to make a decision as to whether you feel this is the case based on the information presented to you."

A pilot study involving ten respondents and using the above video and verbal instruction provided evidence that this aspect of the instrument consistently facilitated respondent reasoning about the identified individual's health status (Task), therefore, satisfying the above criterion.

In relation to the latter issue a *consistency criterion* applies. To meet this criterion verbalisations should be pertinent, and be logically consistent with the verbalisations

that immediately precede them. Should the items in a sequence of verbalisations not be related to each other or consistent, then independent or random processes could explain their generation. This could refute the claims that the verbalisations are goal-directed, cumulative processes with the potential for generating answers and solutions (Ericson & Simon, 1993). The converse is true if the verbalisations conform to the consistency criterion in that it implies a higher-level of control and organisation of the processes underpinning the verbalisations.

Consistency in this context does not, therefore, apply to the volume of data generated in each experiment. There is little variation between studies using think aloud in relation to the average rates of verbalisation. Newell & Simon (1972, p.165) report that protocols average approximately two words per second citing an example of " 20 minutes = 2186 words." Other think aloud protocols range from 50 - 110 words/minute (Ohlsson, 1980; Biggs, 1978), whereas normal relaxed continuous talking is said to produce between 150 - 200 words per minute. With regard to these differing rates of verbalisation Ericson & Simon (1993) believe it would be unreasonable to expect respondents to verbalise faster in experiments than in normal conversation and words per minute is a poor measure for comparing results across tasks.

The crux of the *memory criterion* is that a subset of the information heeded during task performance will be remembered. When subjects think aloud or give retrospective reports much of the information coming to conscious attention will be remembered and available for retrieval. Identification of similar information can then be made at two different parts of the protocol (concurrent & retrospective). If the verbalisations meet these criteria, Ericson & Simon (1993) assume they could only be produced by a processing mechanism similar to the one utilised in performing the original task. Meeting the memory criterion will be discussed in relation to issue number four.

4.7.3 The completeness of the verbal reports as a record of concurrent task-oriented student nurse reasoning about health status, and the role that prompting plays in this.

It is currently well recognised that verbal reports of cognitive process are often incomplete. Many processes involved in undertaking a task are subconscious, this implies there are instances where subjects cannot or do not report their processes (Nissbett & Wilson, 1977; Hayes, 1982; Bryne, 1983). Experts fall into this category whereby many of their cognitive processes have, over time and experience become implicit to the point where they are unable to spontaneously explain the route to a solution or decision (they know more than they can say without deep deliberation). Incompleteness of reports does not pose great difficulties according to Newall and Simon (1972) who posit that verbal reports merely enable us to infer from the respondents verbalisations, what he knows and what operations he performs at any one time. Hayes (1982, p.86) supports this position and claims that "While protocols are incomplete, we must recognise that they are less incomplete than nearly any other method available to us." Consequently a concern for completeness should favour protocol analysis rather than discredit it (Hayes, 1982).

It is, therefore, inevitable that verbal protocols will, to some degree be incomplete. Hayes (1982) claims the psychologists task in analysing protocols is to take the incomplete record provided, together with a knowledge of human capabilities (critical thinking abilities /dispositions in this case) and infer from these a model of the underlying cognitive processes by which the respondent performs the designated assignment.

To further clarify this position Hayes (1982, p.77) uses the following analogy; "analysing a protocol is like following the tracks of a porpoise. Occasionally, the porpoise reveals itself by breaking the surface of the sea. Its brief surfacings are like

the glimpses which the protocols afford us of underlying mental processes. Between surfacings, the mental processes runs deep and silent. Our task is to infer the course of the process from these brief traces." The combinations of timed standardised prompting and cross-examination was, thus, intended to extend the *brief traces* and provide as complete a set of verbal protocols as possible.

Experimenter prompting is commonly used in protocol analysis to maintain verbalisation continuity and minimise the length of respondents' lapses into silent thought. These issues can have implications for the completeness of the protocols but if used inappropriately can alter the nature of the task directed cognitive processes. For example, specific probes designed to elicit specific types of information may suggest to respondents what aspects of the task are important, or desired by the experimenter (Ericsson & Simon, 1980; 1984; Byrne, 1983).

Ericsson & Simon (1993, p. 83) posit that reminders to verbalise should be '.given after 15 seconds to 1 minute' and are generally standardised in order to avoid changing the course and structure of the cognitive processes by offering cues which may elicit a self - observation process, or produce, "... an other - oriented description as a response." An example of this would be 'what are you thinking about'. Prompts in the concurrent protocols will, therefore, be of a standardised non - directed form, e.g. "please keep talking" or "remember please keep thinking aloud." Prompts in the immediate post protocol questioning which is designed to expand the protocol to represent the limits of knowledge stored, will take a similar form to those alluded to above, e.g. "why do you say that?" or "what is your thinking behind that comment?"

During the pilot study (N=10) an initial prompting strategy was to prompt after a 15 second subject lapse into silence. This worked reasonably well for some respondents, but posed problems for others. Two of the early volunteer pilot respondents experienced problems with frequent lapses into silences of greater than 15 seconds.

The effect of prompts as previously described did little to enhance completeness of reports, and in some cases resulted in non-pertinent verbalisations. On questioning the respondents concerned the problem was found to be that in these two cases, English was not the participant's first language. Additional processing had to take place as a consequence leading to a situation whereby the respondents were not only missing items of task information but were responding inappropriately to prompts. The following abstract from a debriefing interview revealed the extent of the problem:

> " Yeah, the trouble is being a foreigner, I've been in England for only four years now, I do have certain problems with the English language because when somebody asks me a question, I've got to translate it into my mother language which is French, then retranslate it into English which might take longer compared to an British - British spoken person."

Ericson & Simon (1993) recognise this phenomena and use it as an example of how encoding processes that are not automatic can slow processes down. Persons fluent in a second language can usually think aloud in that language while simultaneously thinking silently in the oral code of their native language. Processes in this instance may be slowed marginally if at all. However, in other instances the amount of slowing will depend upon the individual's skill in the second language.

Other debriefing reports indicated several respondent's preoccupation with the perceived length of their silences in relation to the agreed prompting strategy. For example:

> " I mean, one of the main problems which I encountered while doing this exercise is, for example, when a person is talking you can't let him finish the whole sentence. Because if you do that, the time will start elapsing. So if when I'm talking I don't hear what the person is saying, he might be saying a

very important sentence at that time, and if I missed it , it might put me in the wrong direction."

Although this problem was voiced by several pilot respondents they appeared to be prepared to accept the situation and potential missed information, because the rewinding facility was not used to any great extent. Conversations with think aloud subjects in the USA, for whom researchers only allowed a few seconds silence, indicated that in these circumstances respondents often consciously verbalise non-pertinent utterances in an effort to maintain their verbalisations. In view of these reports and a recognition that respondents had to attend to incoming information as an antecedent to their verbalisations, it was decided to double the prompting time to 30 seconds of silence. This strategy would also satisfy the prompting and reactivity concerns of Russo et al. (1989) where they state that in order to reduce the reactivity of protocols, prompts should be kept to a minimum in most situations.

This strategy appeared to work well in that respondents participating under these conditions did not report similar concerns and prompting requirements were reduced, although it was noted that this could be due to other factors, one being that pilot respondents were not from an homogenous group, i.e. they were at different stages of professional education and knowledge development. The use of the remote control facility was reinforced resulting in increased utility in some respondents.

4.7.4 Procedures used to complement the concurrent protocols to facilitate as complete a description of student nurses' critical reasoning about health status as possible.

In respect of the thinking aloud technique and subsequent protocol development, Kuipers et al. (1988) supplement verbal protocols with immediate posteriori cross examination protocols. They support this strategy by suggesting that thinking aloud protocols are sensitive to the natural control flow of the respondent's problem solving but it is insensitive to the limits of the knowledge stored. Cross-examination protocols on the other hand ask the respondent to respond to specific questions about the problem at hand. These questions probe the limits of a respondent's knowledge directly but are insensitive to the respondent's natural control structure. Combining the two methods enables the examination of different aspects of a respondent's knowledge and representation.

Much of the criticism regarding veridicality of retrospective reports as data arose as a result of the work of Nissbett & Wilson (1977) who claimed that individuals could not provide veridical reports of their cognitive processes, therefore, the utility of reports for inferring information processes was questionable. Individuals they say do have access to a great storehouse of private knowledge yet do not appear to have access to memories of their mental processes. Nisbett & Wilson (1977, p.233) posit that when asked questions about their cognitive processes, subjects frequently do not base answers on memories of specific events but theorise about their processes, for example:

> " When reporting on the effects of stimuli, people may not interrogate a memory of the cognitive processes that operated on the stimuli; instead, they may base their reports on implicit, a priori theories about the causal connection between stimulus and response."

Although this study does not propose to examine retrospective reports of respondents' cognitive processes, i. e., retrieval and recognition processes, it does

intend to describe the products of cognitive processes in the form of verbalised thoughts related to a task. The fact that Nisbett & Wilson (1977) assert that people base their reports on a priori theories and causal connections suggests a combination of STM and long term memory (LTM) items. In the context of this study therefore using a form of retrospective questioning appears eminently suitable for the illustration of criticality in reasoning about complex human phenomena.

A frequent critique of many of the studies reviewed by Nisbett & Wilson (1977) were of instances where the time lapse between task and probe was sufficiently great to make it unlikely that the relevant information would remain in STM and consequently less accessible. Regarding this issue Ericson & Simon (1993) conclude that the accuracy of verbal reports depends on the procedures employed to elicit them and the interrelationship between the requested information and the actual sequence of heeded information. The central issue of methodology in this context then is to reduce the time lapse between task and post protocol questioning and request information about points previously heeded in the course of the primary task.

In order to achieve this a similar method to Kuipers et al., (1988) was adopted with some modification. In using post protocol cross-examination Kuipers et al., probe the limits of the respondent's knowledge in a fashion akin to oral examination. This suggests the pressing of a subject to furnish an answer or decision to some extent. Given that in this study no such aim is envisaged in that, the naturalistic reasoning strategies employed are the primary focus as opposed to the accuracy of the decision. A less threatening approach was, thus, considered appropriate to avoid the possibility of ego threat (Gray, 1994). To illustrate the breadth, depth and application of knowledge, respondents were questioned immediately after their post simulation decision. This approach is akin to stimulated recall as identified by Elstein et al. (1978), but without the use of videotape. Post simulation stimulated recall will probe the respondent's responses to issues raised by themselves in relation to the task at

hand. This, it is envisaged, would require a degree of mixing of information held in STM with personal knowledge and experiences held in LTM which may influence reasoning. This should also furnish evidence sufficient to satisfy the memory criterion for protocol and instrument validity previously identified.

Questions were drawn from utterances in the respondent's concurrent protocol which were suggestive of underlying reasoning processes, e.g. inductive or deductive conclusions, opinions or stereotypical assertions. The points in the protocol at which these arise were noted by means of a numerical travel counter integral to the audiotape recorder. This would enable clarification of the respondent's comments in the event that the researcher's fieldnotes were incomplete. Examples arising from the pilot studies were:

"Why did you say Billy needs to take more exercise? "

" Why do you think eating a lot of frozen food is such a problem?"

" Why do you think socialising is so important to Billy's health?"

Because the number and referential nature of questions were dependent on the nature of the respondent's protocol the post judgement questions could not be standardised. These, however, could be influenced by respondents' interaction with the task itself. It was proposed that this methodology would: reduce the time oriented problems of retrospective verbal reports; facilitate probing of the depth and breadth of respondents' knowledge, plus attitudes, values, beliefs and the mixing of concurrent and retrospective reports in order to access a global description of respondent's reasoning. This would have no effect on primary task performance and involve level 2 and possibly level 3 verbalisation.

4.7.5 The technology required to collect verbal data, and its appropriate employment.

Thus far, the methods proposed for data collection during phases 2 & 3 are to involve the subjects viewing a videotaped client simulation, whilst verbalising their thoughts in relation to a specific task concurrently. Respondent's verbalisations will be recorded simultaneously. Respondents will be offered the opportunity to 'warm up ' or practice thinking aloud. Respondents will also be offered the opportunity to access missed information, or recap forgotten information. Following the videotaped simulation the respondents will be asked to make a task related decision, and will be posed another general task and construct related question. One particular critical thinking skill identified by Anderson (1942) Ennis (1962) and McPeck (1981) is the ability to recognise when there is sufficient evidence on which to base judgements. This is particularly applicable to nursing practice, therefore the following question was posed to the respondents at this point:

> " Do you think that there was enough information to enable you to make this type of decision?"

Finally, respondents were questioned regarding aspects of their concurrent task related protocols which was also recorded. The procedure for this type of questioning did not involve any prompting whatsoever on the part of the researcher. Subjects were told that this was to be the case and when they felt that they had dealt with the question to their satisfaction they should indicate this by saying, for example "that's it." The researcher would then proceed to the next question. This strategy rests on the underlying assumption that critical thinking ability, if present, is an autonomous and habitual activity. Paul (1992, p.45), in relation to the human mind's tendency towards critical thinking, posits:

> "It is certainly of the nature of the mind to think - spontaneously, continuously, and pervasively - but it is not of the nature of the human mind to think critically about the standards and principles guiding its spontaneous

thought. It has no built-in drive to question its innate tendency to believe what it wants to believe, what makes it comfortable, what is simple rather than complex, and what is commonly believed and socially rewarded. The human mind is ordinarily at peace with itself as it internalises and creates biases, prejudices, falsehoods, half-truths and distortions. Compartmentalised contradictions do not by their very nature disturb those who take them in and selectively use them."

This proposes critical thinking to be a conscious effort, therefore, if the curriculum intentions are being achieved evidence of the development or presence of critical thought should be evident in the reasoning of student nurses in situations that warrant it. It is also recognised that the strategy of not prompting respondents during their stimulated recall responses may add another context to the nature of these responses if not clearly explained.

Together, the recorded concurrent verbalisations plus the verbal reports pertaining to the respondents' post decision stimulated recall would constitute the qualitative data.

The equipment required to conduct the above experiments included (Table 4.7.5.1):

Table 4.7.5.1 Equipment Required for Qualitative Data Collection.

1, VHS video recorder,
1, Television Monitor
1, Audiotape recorder with integral numerical counter
1, Tie microphone
Blank audiotapes, approximately 1 per subject
1, Remote control facility
1, Set of headphones to isolate simulation narrative from subject verbalisations.
1, Digital stopwatch for prompting purposes (30 secs)
1, Pre-recorded client simulation (video)
2, Pre-recorded videotaped warm up tasks
1, Table to accommodate equipment and taking of fieldnotes
2, Chairs - (1 subject; 1 - researcher)
Fieldnotes equipment as required.

The above equipment was deployed in a psychological laboratory, in order to promote a less threatening environment, respondent privacy, respondent confidentiality, noise and extraneous stimuli reduction and enhanced recording quality.

4.7.6 Instructions for Participants.

The use of precise instructions to subjects with regard to the means and importance of thinking aloud is strongly advocated by all workers in the protocol analysis field (Ericson & Simon, 1993; Bryne, 1983; Hayes, 1982; Grobe et al., 1991; Westfall et al. 1986; Fonteyn & Grobe, 1994). Instructions for the purposes of this study are to be given in written and verbal format. Written instructions appear at Appendix 2.

The recruitment strategy involved the verbal explanation of the nature and aims of the proposed study, followed by a request for the entire group to undertake the WGCTA in the third week of their new course. In order to preserve the integrity of the test, the precise name of the test was withheld and the group were asked if they would consent to undertake a pencil and paper reasoning test in a pre & post test design. The methods of data collection for phases 2 and 3 were then explained and volunteers requested. Some 20 volunteers were forthcoming after this initial request, which in relation to general qualitative sample sizes appeared more than sufficient. This number was, however, reduced to 13 as volunteers withdrew their consent upon further deliberation. The volunteer strategy would also ensure randomisation of sample. A consent form was designed to include both aspects of data collection, and this was administered to the group following ethical committee approval (See appendix 3 and appendix 4).

4.7.7 Evaluation of the Instrumentation for Phases 2 & 3.

The methodology in relation to phase 2 and 3 data collection was evaluated from data provided by a pilot respondent debriefing questionnaire (see appendix 5). Volunteer pilot study respondents (N=10) predominantly evaluated the preparation for and the conduction of the experiments positively as previously discussed. Certain comments have resulted in modification of methods to good effect. The range and deployment of equipment is deemed fit for purpose. Finally, primary analysis of the sets of pilot verbal data appears to meet the relevance, consistency, veridicality and memory criterion outlined. This evaluation utilised four tests of protocol validity as proposed by Ericson & Simon (1993) as follows:

1. If a verbalisation describes a situation that the subject can perceive directly, its correspondence with the stimuli can be checked;

2. Its relevance to the task and the plausible steps towards a solution

(as determined by task analysis) can be assessed;

3. Its consistency with just previously verbalised information presumed to be in STM can be checked;

4. Whenever there is reason to believe that verbalised information will be committed to memory, its presence in memory can be tested by subsequent demands for recall or recognition. (as in post protocol questioning).

4.8 The data

The quantitative data relative to phases 1 and 4 of the study will be in the form of numerical scores achieved by the individual respondents from the 80 item WGCTA test. These will be subject to appropriate statistical tests in order to identify mean scores and correlations with specific descriptive variables. The qualitative data will comprise the recorded verbal data relative to phases 2 and 3, collected by the means identified. This will then be transcribed verbatim, resulting in a collection of written text generated by transcription of audiotapes encapsulating the description of respondent's reasoning in relation to the task.

CHAPTER FIVE

METHODOLOGY

Study Design and Data Collection Procedures

5.1 Research Design Rationale.

Given the problem background issues, the nature and scope of the research questions and the issues identified in the theoretical and empirical literature review, a descriptive exploratory design incorporating across-method triangulation within a longitudinal case study was developed. This incorporated same subject multi-phase sampling to produce evidence of changes in the intended behavioural outcome (critical thinking) as a result of the CFP curriculum. These aspects of design in relation to this study are discussed below.

5.1.1 *Descriptive - Exploratory Design*

The descriptive-exploratory design elements are appropriate because the study's intention was to examine a discrete characteristic (critical thinking) in a specific population (Brink & Woods, 1988). The population in this context are a group of Project 2000 student nurses undertaking their pre-registration education at the, then, Sister Dora College of Nursing and Midwifery. The design, thus, entails one variable, albeit a complex one, and one population to be studied over time (the duration of a specific component of the curriculum). Another aspect of the design is the development of an alternative methodology to the type which has predominated in previous studies as described in chapter two. The flexibility associated with this research design is warranted given the developmental status of the task and the anticipated lack of researcher control over the process of illuminative quasi-naturalistic qualitative data collection. In other words the data will be observed as they happen and recorded with the minimum of researcher control whilst facilitating participant control of their reasoning processes. The aim of the

approach is to produce new knowledge relating to critical thinking as an outcome of a particular nursing curriculum compared with that generated by formal instruments such as the Watson & Glaser instruments

5.1.2 *Case -Study*

Aspects of the case study method also complement the purpose of this study for three reasons:

1. It intends to explore a single unit of study in the form of one institution.
2. A small number of participants are involved who are examined intensively
3. Case studies have the potential for revealing important findings that can generate new hypotheses for testing. Thus, case studies can lead to future larger sample studies (Burns & Grove, 1995).

5.1.3 *Longitudinal Studies*

The main value of a longitudinal approach to this study was the ability to demonstrate trends or changes over time and the temporal sequencing of phenomena which is purported to reflect causality (Polit & Hungler, 1989). Establishing causality is not, however, the remit of this study. Various types of longitudinal study exist but the type of particular relevance to this study is that of panel studies, in which the same participants are used to supply data at multiple points in time. Since the same people are examined repeatedly, the researcher can identify the participants who did and did not change and possibly identify characteristics of the sub-groups. Potential problems with this design are that they can be extremely difficult and expensive to manage, and participants may be lost at different points in the study. Attrition is problematic for the researcher in that the participants lost to the study may differ in important aspects from the people who remain. This may impair the generalisability of the findings. Given, however, the evaluative, descriptive and, therefore, illuminative status of this research in parallel with

the non-probability sampling strategy, the issue of generalisability at this stage does not apply. The key outcome is to establish methods to illuminate the existence or degree to which critical thinking exists as a programme behavioural outcome in student nurse's real-time clinically oriented reasoning.

The following longitudinal programme of data collection was thus developed to facilitate evaluation of the effect of the eighteen month CFP curriculum upon subjects critical thinking abilities.

<0 mths- - - <u>Common Foundation Programme Continuum</u> - -18 mths>

Phase 1	Phase 2	Phase 3	Phase 4
(Pre-test)	Think Aloud	Think Aloud	(Post-test)
WGCTA	Verbal reports	Verbal reports	WGCTA

Phase 1 (Month 1)

Aimed to establish the degree of content independent critical thinking ability as an element of respondents' entry behaviour, by using the Watson Glaser Critical Thinking Appraisal, Form C (1991, UK Edition).

Phase 2 (Month 9)

Aimed to determine evidence of critical thinking ability in relation to a nursing context. This involved the collection of concurrent and retrospective verbal data whilst respondents were engaged in a nursing oriented cognitive task and subsequent protocol analysis. This was timetabled 9 months into the programme for reasons identified below.

Phase 3 (Month 17)

The aim for this phase was as for phase 2 with the added emphasis to demonstrate differences in or between respondents' critical thinking performances. This phase was scheduled for the penultimate month of the CFP by which time the programme outcomes should conceivably have been achieved.

Phase 4 (Month 17)

Aimed to establish the end of CFP group mean raw score for comparison with the pre-test mean raw score as a measure of curricular impact upon critical thinking performance as measured by the WGCTA.

The Common Foundation Programme (CFP) was exclusively chosen as the period of evaluation for the following reasons (For further information of the CFP see chapter 3 The Curriculum):

- Initial time constraints placed upon the conduct of the study;
- Student cohorts experience broadly similar curricular content during the CFP;
- Curricular experiences, content and group sizes change significantly for Branch Programmes;
- Critical Thinking is expressed as a specific outcome for the CFP.

In the time between data collection phases learners were subject to broadly similar intervention in the form of curricular content and clinical experience. Intervals were carefully spaced to ensure students had all been exposed to the theoretical content upon which the qualitative data collection methods would focus. This was especially pertinent to the first qualitative data phase because it would introduce an unfair bias into subject reasoning performance founded upon the consensus that a knowledge base is a pre-requisite to critical thinking.

5.1.4 *Across-method triangulation*

Triangulation in research is defined as the combination of two or more theories, data sources or methods in the study of a single phenomenon (Kimchi, Polivka, & Stevenson, 1991). Begley (1996) suggests that a combination of methods can provide a fuller and more accurate picture of the population studied. Combining multiple methods is also a useful way of bridging the divide between quantitative and interpretative (qualitative) methodologies for the express aim of increasing the completeness and confidence in research findings. Miles & Huberman (1994, p.40) add to this position by claiming that ultimately 'We have to face the fact that numbers and words are both needed to understand the world.' Triangulation, first used in a research context by Campbell & Fiske (1959) derives from the profession of surveying where measurements are recorded from multiple points to identify more accurately a particular area. Cook (1983) recommends triangulation as a way to identify bias in quantitative studies by comparing findings with the results of qualitative methods. This of course might be taken to presuppose a bias to be found in the quantitative studies, and that qualitative methods are bias free. Triangulation in this sense does not mean that one method necessarily validates the other, but essentially should increase confidence in triangulated findings related to a particular phenomenon (Silverman, 1985).

Denzin (1989) identified 5 types of triangulation that includes: theory, data, investigator, methods and multiple triangulation. The type adopted by this study is that of methods triangulation and, more specifically, across- method triangulation. This is the use of quantitative and qualitative data with the aim of achieving a degree of completeness and possibly convergent measurement validity, in relation to the examination of a complex phenomenon. As with many methods triangulation needs to be used appropriately and with caution if it is to achieve the specific aims intended. Table 5.1.4.1 lists the

advantages and disadvantages of triangulation in nursing research as identified by Redfern & Norman (1994).

Table 5.1.4.1 Advantages & Disadvantages of Using Triangulation in Nursing Research

Advantages	Disadvantages
Overcomes the bias of single-method, single-observer, single theory studies.	No guarantee of internal and external validity.
Increases confidence in the results.	May compound sources of error
Allows development and validation of instruments and methods (confirmation).	Methods selected may not be the right ones.
Provides an understanding of the domain (completeness).	Unit of analysis might not apply to all methods.
Ideal for complex social issues.	Cannot compensate for researcher bias.
Overcomes the elite bias of naturalistic research.	Expensive.
Overcomes the holistic fallacy of naturalistic research.	No use with the wrong question.
Allows divergent results to enrich explanation.	Replication difficult.

5.2 The Sampling Strategy and Sample

The sampling strategy was informed by the study design and the nature of the developmental task directed towards the fine-grained qualitative analysis of the resulting verbal protocols. The descriptive-exploratory nature of the study plus the prospect of large quantities of rich qualitative data being generated by the think aloud sample of participants supported a same subject design. Random selection to the study group was compromised by the original commissioning criteria (limited availability of Project 2000 students within the institution) limitations imposed by student intake frequency, by accessibility to students from other educational institutions and the logistical problems surrounding the data collection methods. Thus one entire student group from the host institution was used as a convenience target population (n = 57). The group comprised

50 females and 7 males with an age range of 18-40 yrs (mean 24 yrs). The majority of the group were white (n=45) with five other ethnic categories being represented by very small numbers. The majority of the group entered the programme via the traditional entry route with 5 0 level/GCSE qualifications. A random selection of volunteers were recruited for the qualitative data sample (n = 12, following the loss of one participant to maternity leave) which also included a range of ages, ethnicity, entry qualifications and both genders.

A volunteer approach was used because of the potential for think aloud techniques to be perceived as intimidating or challenging to inexperienced respondents. The potential for biased sampling is recognised in that respondents with certain personality traits, i.e. self-confidence or extroversion could be more likely to volunteer. Self-confidence or extroversion, however, does not necessarily imply critical thinking ability or the converse. The volunteer approach does also involve a degree of random selection in that all students in the population have the opportunity to volunteer, and the researcher would have no knowledge who such volunteers would be, thus, the prospect of researcher selection bias is avoided. A full demographic profile of the sample is attached at appendix 7.

5.3 Procedures:

5.3.1 *Phases 1 & 4*

In relation to phase 1 - The WGCTA, Form C (1991) was administered to the whole group (N=57) in the third week of their course. Much of the course thus far had dealt primarily with matters of administration and introduction, consequently very little domain specific content had been acquired by the learners. The test was administered following advice from a Charted Psychologist supervising the study, and by adhering to the strict instructions laid down by the authors.

Tests were conducted in two subgroups on differing college sites some eighteen hours apart. Appropriate sized rooms with adequate lighting and ventilation to ensure a degree of comfort were pre-booked. Seating was arranged in examination style for invigilation purposes. An examination in progress sign was attached to the room door to reduce extraneous noise distraction or interruptions. The appropriate pencils with spares and erasers were supplied to the participants. When the sub-group were all present the nature of the study was explained once more and they were asked to re-iterate their consent to participate in the study. The Watson and Glaser Critical Thinking Appraisal papers were then distributed with instruction to participants not to overturn the papers until instructed.

The untimed approach to test administration was chosen to minimise group anxieties and in light of the author's claims that the WGCTA is primarily a test of power as opposed to speed. Watson & Glaser (1991) posit however, that the majority of people should be able to complete the test within forty minutes. To enable the possibility of broader comparisons of subsequent raw scores to norm data, subjects were requested to mark the last completed item with an asterisk, when instructed by the researcher at 40 minutes. This was established by use of a stopwatch. From that point, test completion was determined by individual participant performance. Upon completion participants' raw scores were determined by using the test-scoring template as supplied by the publishers. The same procedures were used for phase 4 in the final month of the CFP although the number of group members had been reduced to 43 by attrition at that point.

5.3.2 *Procedures Phases 2 & 3* (phase 2, at 9mths - phase 3, at 17mths into CFP).

The equipment required to facilitate data collection for these phases included the items identified previously in table 4.7.5.1 and reproduced here.

1, VHS video recorder,

1, Television Monitor

1, Audiotape recorder with integral numerical counter

1, Tie microphone

Blank audiotapes, approximately 1 per subject

1, Remote control facility

1, Set of headphones to isolate simulation narrative from subject verbalisations.

1, Digital stopwatch for prompting purposes (30 secs)

1, Pre-recorded client simulation (video)

2, Pre-recorded videotaped warm up tasks

1, Table to accommodate equipment and taking of fieldnotes

2, Chairs - (1 subject; 1 - researcher)

Fieldnotes equipment as required.

The above equipment was deployed in a psychological laboratory as discussed in chapter four (p.185).

Appointments were made with volunteer participants specifying the time and location for the think aloud data collection. The psychology laboratory was then booked correspondingly. The use of precise instructions to subjects with regard to the means and importance of thinking aloud, is strongly advocated by all workers in the protocol analysis field (Ericson & Simon, 1993; Bryne, 1983; Hayes, 1982; Grobe et al. 1991; Westfall et al. 1986; Fonteyn & Grobe, 1994). Instructions for the purposes of this study were thus given in written and verbal format (Written instructions appear at Appendix 3)

whilst arranging participant appointments, so as to prepare participants for the data collection events.

Prior to the allotted subject appointment, the researcher arranged the above equipment and checked their function. A notice informing others of an experiment in progress was displayed to minimise disruptions. On arrival the subject was greeted, shown into the laboratory and the attendant equipment explained. The think aloud instructions and the general layout and purpose of the experiment were repeated verbally and questions relating to the equipment were answered as required.

The participants were then asked to don the headphones and tie microphone. Although the warm up exercises were not recorded donning the equipment early facilitated acclimatisation and a short check of the participant's recording quality.

Following this the silent traffic scene video was commenced, and the participant was instructed to merely give a verbal commentary (talk aloud) on the journey as viewed from the hypothetical driver's seat. The researcher as required gave an example of this. This initial warm up exercise could last up to 20 minutes if the participant wished to see the video in its entirety. During this time the researcher was present so that the participant became used to verbalising in his presence.

When the participant indicated satisfaction with their verbalising performance they were then asked if they would like to view the second warm up exercise. They were informed that this exercise also included a traffic scene but with the addition of an accompanying narrative. Subjects were then set the following simple task:

" I would like you to tell me what you think is happening, and what you would do if you were in the driving seat of the pursuing vehicle by thinking aloud."

The video lasts approximately 10 minutes (see appendix 8 for narrative). At the conclusion of this, the participant was asked if they are ready to try the simulation proper. If they indicated readiness, the client simulation video was loaded and forwarded to the correct position.

At this point, the participants were given the associated task which facilitated the verbal report of their reasoning processes. The task was as follows:

> "I want you to imagine that you are in a nurse-client interaction. The client named Billy is claiming that he is perfectly healthy and does not require any advice. I want you to make a decision as to whether you feel this is the case based on the information presented to you."

In addition to this the remote control facility was given to the participant and control of its use was reinforced. The participants were then informed of the prompting strategy to be used after 30 seconds of silence. If the participant had no further questions the task was repeated and the videotaped client simulation commenced. Simultaneously the tape recorder was switched on, the numerical counter set at zero and the timer started. From this point the participant verbalised concurrently about the task in relation to the information provided in the simulation.

The researcher, sitting in close proximity to the participant, now had to listen to the participants' verbalisations for points to consider in the post task questioning aspect of the experiment, these were noted in writing. The stopwatch also had to be observed simultaneously for the need to prompt. In the event of a prompt the stopwatch was reset for another 30 seconds and so on.

At the end of the client simulation the video recorder was switched off, the audiotape recorder was left on and the participant asked to verbalise their decision in relation to the task (Post Simulation Judgement).

Following this the participant was then asked the structured question (Test for Adequacy):

"Do you think that there was enough information there to enable you to make this type of decision."

This question was designed to elicit evidence of whether: participants recognised when there were appropriate amounts of evidence available to make a decision; and their supporting arguments.

Data collection now entered the post-decision questioning phase (Post Judgement Stimulated Recall). The researcher now asked questions in relation to selected issues raised by the individual participant in relation to the task. Participants were informed that responses were to be concluded at their own discretion and that no indications of sufficiency or completeness would be forthcoming from the researcher. Questions were intended to be open-ended whenever possible, e.g.

" At point ..... in your protocol you said ..... why did you say that?"

"why do you think that?"

"why is this important in this or Billy's case?"

Data collection was concluded when post protocol questions were exhausted. The tape recording was then terminated. The recorded protocols were then ready to be transcribed verbatim by the researcher at a suitable time.

CHAPTER SIX

Presentation and Analysis of Qualitative Data.

6.1 *Notes on Transcription*

Sandelowski (1994) refers to a transcript as an exact copy of speech which has similar documentary veracity to that of a photograph. She cautions, however, that the process of transforming oral speech into printed copy results in a transformation that is representative of the original events but not isomorphic with them. For example, changes of pitch, volume, stress and speed of speech are difficult to represent adequately without affecting the readability of the transcript. Non-verbal behaviours such as posture, body language, in conjunction with accompanying sounds like laughter or sighing can add additional contextual contingencies to participant utterances that can further complicate the representation and analytical process. Even attempting to punctuate the transcript may capture the relationships and emphasis of words accurately but still misrepresent participants' talking behaviours. Researchers using transcripts, thus, have to make certain choices regarding which aspects of speech will be preserved and how they will appear in text.

In the case of this study, the choice was made to include all utterances verbatim including paralanguage. Paralanguage is the series of informal vocal utterances that sometimes accompany or is interspersed with the vocabulary of formal language, e.g. "er", "erm", "ah" or "hmm." These were included because of the naturalistic emphasis and the potential reasoning processes, such as uncertainty, that they may represent. Punctuation of the transcript was not deemed necessary because the aim was to examine performance of a behavioural construct, and not to focus predominantly, upon the precise literal meaning of the text (Burnard, 1994). Natural

pauses in participant speech were represented by a dash (-) and these were not precisely differentiated chronologically due to the general 30 second prompting rule. In the rare event of utterance interpretation difficulties the tape speed adjustment was used to enhance researcher interpretation. When this strategy proved unsuccessful third parties, in the form of professional colleagues, were used for their undirected interpretations. In the event that interpretative agreement could not be reached, the relevant utterance was omitted and represented by a series of asterisks. This, however, occurred on only several occasions (<10) and transcriptions were, thus, predominantly complete records of participants' verbal reports. Ultimately less than ten single words were omitted from the total body of qualitative data because they were essentially unintelligible. The omission of this small number of single words would not, it was concluded, have altered the subsequent categorisation of the relevant participants' performance in critical thinking.

Researcher and participant utterances in the transcipts were represented thus:

Researcher - **(R)**

Participant - **(P)**

The sequences of the transcripts were categorised as follows:

Simulation Mediated Attentive Focal Universe

Post Simulation Judgement

Post Judgement Test for Adequacy

Post Judgement Stimulated Recall

Data analysis for the qualitative data for phases 2 and 3 required the development of a suitable analytic framework to fit the purpose of the study. A full account of the developmental and decision making process is given in the following section to

provide a qualitative audit trail (Sandelowski, 1994; Burns & Grove, 1995; Miles & Huberman, 1994).

6.2 *The Development of an Analytic Methodology for Identifying Aspects of Critical Thinking in Verbal Reports of Student Nurses' Reasoning in Relation to an Individual's Health Status.*

Early analytic work utilised some aspects of the grounded theory approach. Participant protocols were subjected to open coding with a view to generating thematic categories (Strauss & Corbin, 1990). This strategy, however, proved fruitless in that the emerging categories were more reflective of participants' 'thick' descriptions of health as opposed to evidence of critical thinking. An alternative strategy that viewed utterances as examples of critical and uncritical reasoning descriptors was subsequently devised and implemented. Participant utterances, for example, were given labels such as:

Hasty generalisation - (Bandman & Bandman 1988).

Assumption

Inference

Stereotypical comment

Evidence based utterance

Subjective judgement

Erroneous interpretation

Appeal to authority

This strategy, however, also appeared to demonstrate little other than idiosyncratic time and context-specific labels that may or may not persist or transfer into the later phase of data collection, i.e. if a participant made a hasty generalisation in phase 2, but not in phase 3 could one conclude that critical thinking was evident, improved or

the converse? A need, therefore, emerged to search for or develop a framework of analysis that transcended the meaning of specific utterances in favour of broader and enduring reasoning generalities that may be transferred across cases consistently to reflect participants' naturalistic central reasoning tendencies.

A search of the literature and iterative attempts at data analysis culminated in an analytic framework that would focus upon the structural complexity of participant's concurrent verbal reasoning or arguments, and whether they reflected fundamental aspects of critical thinking ability. The processes of framework development are presented in this section to enable the reader to appreciate the illuminative, flexible and iterative nature of the task.

One of the initial problems was to bring some sense of order to the unstructured concurrent and retrospective qualitative data collected by means of the think aloud, post simulation judgement, test for adequacy and stimulated recall methods (Appendix 6). Given that the intention of the participants' think aloud data was to identify information attended to, in addition to concurrent reasoning processes and outcomes, a combination of line by line open coding (Straus & Corbin, 1990), incorporating *in vivo* coding (Glaser & Straus, 1968, p. 70; Straus, 1987, p. 33) and *referring phrase analysis* (Kuipers et al. 1988; Grobe et al. 1991) were used to identify discrete data units. A data unit in this context refers to a word, series of words or even sentences that refer discretely to a unique focus. The cumulative foci, thus, contributed to participants', 'Sequential Simulation Mediated Attentive Focal Universe, and relative reasoning descriptors. Table 6.2.1 demonstrates an example:

Table 6.2.1 Data Unit Analysis.

Data Unit	Focus	Reasoning descriptor
'an what he thinks is enough exercise, necessarily isn't	Subjective participant perception of client exercise sufficiency	Induction (effect) i.e., effect of subjective perception upon sufficiency of exercise levels

This strategy produces evidence of aspects of simulation information attended to during the think aloud phase and the degree of processing to which the information is subjected, i.e. to what extent do participants' utterances reflect passive reception of information or active processing as above. Virtual verbatim recall or paraphrasing would be described as *information reception* (IR). Data units are identified and contained by association with a unique referent or focus. These are then numbered to indicate uniqueness and sequence.

The foci which ultimately culminate in the focal universe are derived from the participants' verbatim concurrent reports. The reasoning descriptors following recursive analysis were best described in the context of Cheng & Holyoak's (1989) pragmatic reasoning schemas. Cheng & Holyoak categorised inductions as pragmatically useful in accordance with their reasoning function or goal. Pragmatic reasoning schemas attempt to represent the middle ground between the belief that people typically reason using domain independent formal rules or that people are only able to reason using memory of domain-specific experiences. Pragmatic reasoning schemas involve the use of abstract knowledge structures derived from everyday ordinary life experiences and thus fit with the everyday or informal logic perspective underpinning the study's instrumentation. Pragmatic reasoning schemas consist of a set of generalised context-sensitive rules which unlike purely syntactic

rules are defined in terms of classes of goal such as: taking desirable actions or making predictions about possible future events and relationships to those goals in the form of: obligations; causations; cause and effect; preconditions and allowable actions (Cheng & Holyoak, 1989).

Additional descriptors arising from the general analysis include:

(i) Erroneous utterance (interpretation inconsistent with task or evidence);

(ii) Deduction (deductive conclusion - utterance that implies that a conclusion necessarily follows antecedents).

In summary, to this point the qualitative data represents the number of discrete aspects of information attended to. This essentially represents the participants' sequential simulation mediated attentive focal universe i.e., the evidence attended to by the participant as evidenced by verbalisation, and apparently available for the subsequent task judgement. Secondly, the degree of information processing or passive information reception is also recorded prior to participants' judgements in accordance with the cognitive task. This indicates the volume and nature of participants' evidence, and evidence gathering processes (table 6.2.2). Fig. 6.2.1 demonstrates the sequence of events to this point.

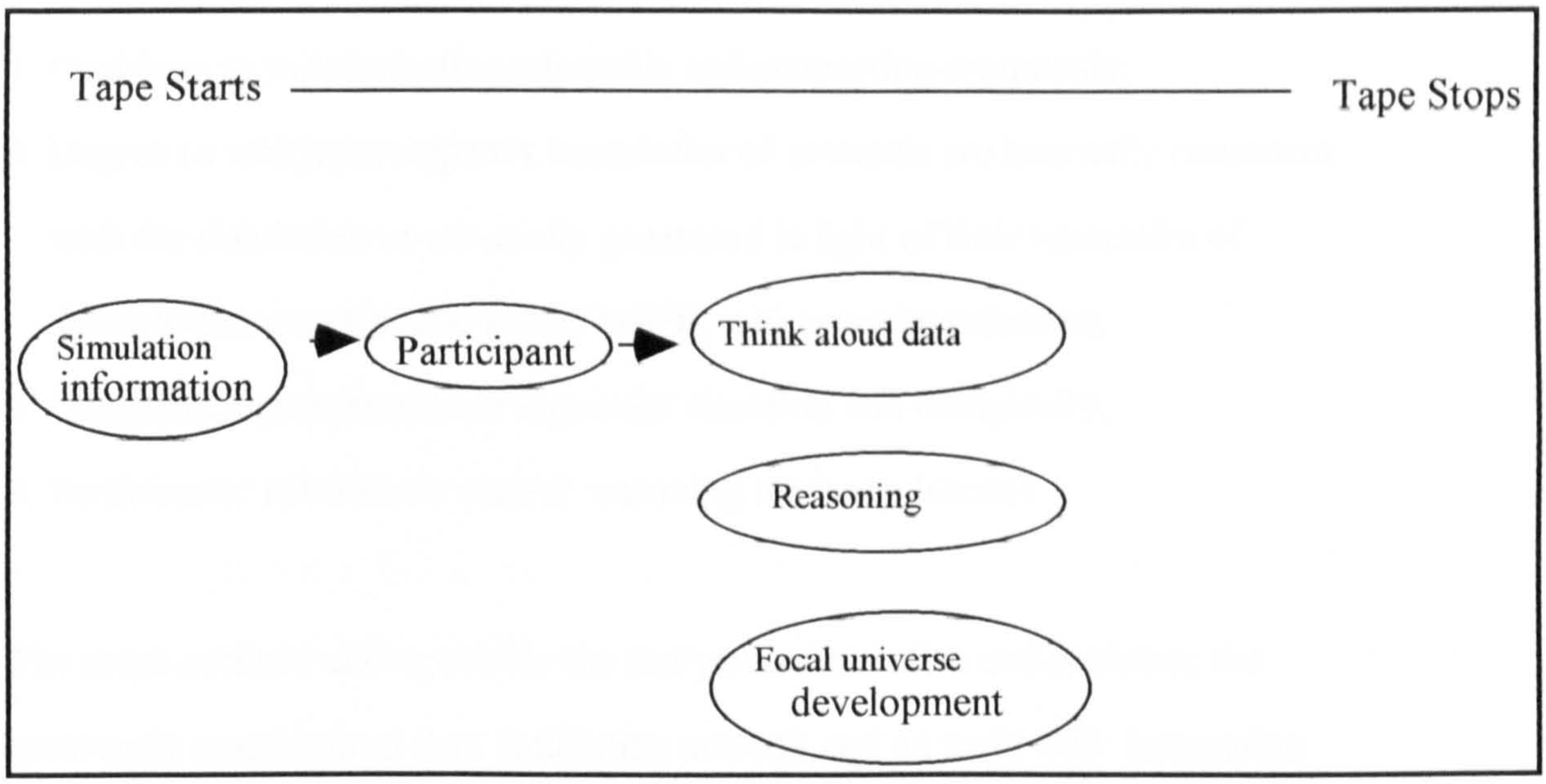


Fig. 6.2.1. Model of Think Aloud Data Collection Processes Prior to Participant Judgement.

Table 6.2.2: Example of summary of think aloud pre-judgement data *Case 1* (S52)

Phase 2:

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
26	2	8	18

6.3 Post Simulation Judgement, Test for Adequacy, Stimulated Recall

In regard to the above sections of data analysis, the description and categorisation of participants' reasoning case studies was described and assessed for evidence of critical thinking in relation to the following criteria:

1. Argument complexity as illuminated by a scale developed from the works of Schoeder et al. (1967); Levi & Tetlock, (1984); Perkins et al. (1991) & Kuhn (1991).
2. Number of focal universe elements available for post simulation judgement;

3. Decisions as to information adequacy and supporting arguments;
4. Degree to which participant's boundaries of evidence are internally consistent with the simulation or externally generated in light of their repertoire of knowledge, experiences, values beliefs, and everyday schemas;
5. Graphical representation of argument structure and complexity;
6. Participants' naturalistic central reasoning tendency (mode).

The steps outlined above, enable the analyst to categorise and structure the previously unstructured data facilitating analysis and an audit trail. Integrative complexity provides the fundamental structure by delineating the data in relation to two cognitive structural properties and their relationships to the respondent's chain of reasoning and argument complexity.

Originally developed by Schoeder, Driver & Streufert (1967) and further developed by Suefeld & Rank (1976), Suefeld & Tetlock (1977), Tetlock, (1983;1984), integrative complexity focuses on the scoring of arguments and people's disposition to consider evidence and counterevidence in the course of reasoning about arguments. Tetlock's (1983;1984) index of integrative complexity with certain modifications was perceived to be an apt tool for this study. This was primarily because the search for genuine evidence, the generation or consideration of alternative theories and the development or use of counterarguments are viewed as fundamental aspects of critical thinking performance. Moreover, critical thinking with its discrete cognitive skills and affective dispositions are accepted as an abstract and complex construct which is difficult to measure discretely. Critical thinking performance is also a matter of degree and disposition, in that, we may think about something critically in one instance about an issue, and not in another instance, even when the time frame between issues is relatively short and the participant domain

similar. The potential extraneous variables impinging on people's ability or disposition to reason critically are legion. However, the desire to search for and manipulate evidence and counterevidence to arguments, may be more pervasive, enduring, and observable if one has internalised critical thinking as a habitual reasoning behaviour and is naturalistically disposed to utilise it in everyday reasoning.

Tetlock (1983a) defines integrative complexity as a combination of two cognitive structural properties, that of differentiation and integration. Differentiation concerns the number of different characteristics or dimensions of a problem or question -at - issue that an individual takes into account whilst engaged in reasoning about such issues. Tetlock offers an example of an undifferentiated view of capital punishment if an individual focuses only one dimension such as: "the need to deter murder" or on "...the immorality of ever taking human life" (p.77). Another example would be when, in regard to the issue of abortion, an individual only focuses on abortion as a basic right for women or limiting women's access to abortion is an infringement of their civil liberties (Tetlock, 1983b). In relation to a health context, an undifferentiated view of this would be evident if an individual focused on only one element e.g., physical health characteristics. Differentiation of this nature reflects a one-sided view only, which neglects obvious arguments to the contrary and, thus, cannot be considered as critical thought.

A more differentiated approach would be evident if individuals recognised at least two different dimensions, such as in relation to the capital punishment issue, when an individual recognised a general need to deter murder plus a general need to avoid the possibility of executing innocent people (Tetlock, 1983a). Another example, in relation to health, would be when an individual recognised the fact that there is more to health than just physical fitness and that there are also psychological factors. The

general rule then is the more dimensions or perspectives (other viewpoints) of an issue that are recognised, the higher is the degree of differentiation.

The interpretation of differentiation used in the context of this study is that the property can have three forms. Thus, for the purpose of this study, when an individual recognises differing aspects relating to only one focus of a complex issue such as health e.g. physical health constitutes regular exercise, good diet, or non-smoking, this would be seen as uni-focal but divergent intra-dimensional differentiation. Generally this would still represent low differentiation.

Secondly, differentiation also would be evident when, in regard to health, an individual recognises at least two focal dimensions (bi-focal), such as physical and psychological factors and their related sub dimensions. They may, however, make no obvious connections between them, for example, how psychological factors can influence physical factors. This would represent moderate differentiation.

Thirdly, if an individual recognised more than two focal elements (multi-focal) of an issue, but added alternative perspectives, e.g. 'of course not everyone who smokes becomes seriously ill or dies young because additional factors are involved or individual needs for social contact differs widely' or one person's stress is another person's stimulation. This portrays an individual's readiness to consider counterevidence, alternative frames of reference or theories and an awareness of the increasing complexity of issues beyond mere alternation on the same dimension, e.g. "some people might think he drinks a lot, on the other hand some people would not". The former would represent high differentiation, but not necessarily high integration.

An additional means of coding differentiations and their contributions to the complexity of arguments is by means of uniqueness and utility. Schroder et al. (1967, p.166) define a dimension as "A unique arrangement of stimuli." It follows, therefore, that any arrangement of stimuli by an individual is a dimension and differentiation should correlate with the potential for the construction of abstract schemata. In order to discriminate one set of stimuli into a discrete dimension, that dimension should have functional uniqueness in that it pertains to or directly refers to the issue-at - hand, and is not identical to another dimension. Should this occur, and it is adjudged not to contribute anything uniquely to the dimension, then it should not be counted as a discrete dimension, and subsequently coded: no functional uniqueness (NFU).

Sets of stimuli should also possess functional utility, this is when they should not be trivial or meaningless and demonstrate some clear role in the participant's reasoning in relation to the cognitive task. If sets of stimuli / utterances fail to demonstrate this, then they should not be counted and thus coded: no functional utility (NFU). Examples of such utterances arising from this study's data were: 'I don't like his wallpaper' or 'I don't like chess'.

In the context of this study any obvious erroneous interpretations of information, i.e. interpretations not consistent with the simulation evidence would be coded similarly, because they would not be perceived as contributing to the arguments in any meaningful or accurate way, and could consequently lead to the construction of fallacious arguments. Such codings serve as a useful means of accounting for all of the qualitative data even though they have no function in identifying critical thinking.

A further important consideration in the measurement of differentiation, is that ideally, the number of possible dimensions which can emerge should not be arbitrarily

limited by the experimental procedure. Thus, the design required a policy of post judgement non-intervention and that the researcher refrain from probing.

In summary, differentiation refers to the representative level of non-limited, self-generated, unique and functional dimensions or foci which maps the components of participants' pre-conclusion reasoning processes.

Integration

Integration refers to the development of increasingly complex connections between the differentiated dimensions. Baron (1988, p.278) suggests integration, in one instance, can exhibit "... search for goals and criteria by which the evidence will be weighed but in other cases it seems to represent the use of evidence to draw a conclusion."

Low integration is exhibited when the individual having recognised differentiations proceeds to view them in isolation, that is they see no other relationships and are, therefore, uni-focal e.g., health is measured solely by physical fitness nothing else is considered. These would be consistent with low uni-focal differentiation, therefore, an integrative complexity composite index of the two properties would be: low differentiation and low integration.

Increasing complexity of integration is exhibited when individuals combine moderate to high differentiations into patterns which may portray an alternative perspective (counter evidence) and/or draw conclusions. This portrays moderate integration, e.g. that there is more to health than physical fitness, there are psychological factors as well. So health is more than just physical fitness. This also produces a comparative or general rule in order to evaluate future or alternative perspectives on the issue.

Thus, an integrative complexity composite index reflecting these argument structures would indicate: moderate -high differentiation, moderate integration.

High integration is exhibited when an individual combines moderate to high differentiations into contingent and complex patterns. Thus, an example of a high integration model might be that:

> Health is a complex composite construct meaning different things to different individuals and cultures. One could appear to be healthy consistent with physical fitness criteria, but be psychologically disturbed. One could even have a physical fitness or physical appearance phobia. Sociological factors also contribute to conceptions of health, not only in relation to roles but also in opportunities to make appropriate health decisions. Health as a construct is, therefore, difficult to measure. Attributing an enduring diagnosis of health, if such a prospect is possible should therefore be based on holistic yet contextually individualised criteria. Even individuals suffering enduring chronic illnesses report periods of relative health.

The integrative complexity composite index for arguments of this nature would be:
High differentiation - high integration.
Integrations (Int) - are evident when it becomes obvious that prior differentiations, or even new ones, are being connected in some way or when a conclusion appears to have been drawn in relation to the preceding dimensions. Conclusions may not be terminal in nature, some reports may include several which function as intermediate conclusions and, thus, may be cumulative. Participants' natural languages may not make for easy identification of such instances. Certain cue terms have, however, been extracted from the literature and data to assist in signifying integrations (Table 6.3.1).

Table 6.3.1 Examples of integration phrases.

“is that”, “ which shows”, “this shows”, “but because of”, “therefore”, "then", "so", "must", "cannot", "so I assume", "but enough to know that", "since", "hence", "would",

On some occasions, however, when such terms do not appear in the participant's natural language, judgements have to be made on alternative signs of integration in relation to the context of the series of utterances and their sequence, e.g., when no indicator terms as above are used, but it is obvious that a conclusion is drawn or a relationship is inferred.

Integrative complexity is seen, therefore, as a composite index of the two cognitive structural properties differentiation and integration. Differentiation should also be viewed as a necessary condition for integration in that differentiations form the reasons or premises for integrations. Another important aspect of the integrative coding system is its emphasis on conceptual structure as opposed to content. There is no in- built philosophical bias. One can advance simple one-sided or complex alternative-rich arguments on any number of viewpoints or content domains. In terms of intregrative complexity functioning as a valid tool for measuring aspects of critical thinking, it is well suited because of its ability to capture participants' interpretative skills, search for evidence and counterevidence in the form of dimensions, the manipulation of dimensions into conclusions or inferences drawn, and the use of evidence in the construction of arguments, counterarguments and concomitant evaluative criteria

Tetlock, (1983a) used a 7 point scale initially developed by Schoeder, Driver & Streufert (1967) to assess individual differences in integrative complexity (table 6.3.2).

Table 6.3.2 Tetlock's 7 Point Argument Complexity Scale.

Scores of 1 represent low differentiation and low integration
Scores of 3 represent moderate to high differentiation and low integration
Scores of 5 represent moderate to high differentiation and moderate integration
Scores of 7 represent high differentiation and high integration.
Scores of 2,4, or 6 are said to represent transition points between levels.

During the early stages of development of the analytic framework great difficulty was experienced in finding clear examples of transition scores. This was exacerbated by the fact that Tetlock did not offer detailed guidance as to how transition scores could be ascertained. A scoring scale of 1 - 4 was, therefore, adapted utilising the works previously referred to as follows:

Scale of Argument / Epistemological Complexity

1 = low unifocal / moderate differentiation and low integration: i.e. low or moderate differentiation culminating in a one-sided or single theory structure argument reflecting a narrow perspective with little search for, or, utilisation of opposing evidence, non consideration of alternatives or context and early closure (Absolutist Epistemology).

2. = Moderate to high differentiation and low integration: i.e. Broadening of dimensions/evidence base, plus an attempt at generating an alternative perspective or recognition of context, still, however, culminating in one-sided or single structure argument. The alternatives are essentially ignored in favour of prevailing structure (Potential Multiplist Epistemology).

3. = Moderate to high differentiation and moderate integration: i.e. Considers multiple dimensions and demonstrates successful generation of an alternative perspective or theory and recognition of contextual issues, which clearly contrasts with their prevailing argument structure or theory and avoids unwarranted integration into a conclusive single structure (Multiplist Epistemology).

4. = High differentiation and High integration: i.e. consideration of multiple relevant dimensions leading to the successful generation of, not only alternative theory structures which clearly contrast with initial or emergent theory structures but includes an attempt at or successful generation of a counterargument or rebuttal to the generated alternative theory utilising appropriate criteria. Closure or definitive conclusions may not necessarily be achieved. (Evaluative Epistemology).

The above levels or argument complexity and associated epistemological foundations reflect how participants use knowledge in their naturalistic processes of knowing and a progression from uncritical to critical reasoning as demonstrated in table 6.3.3:

Table 6.3.3: Progression of Reasoning Complexity.

1	**-**	**concrete or absolutist thinking**
2	**-**	**potential multiplist epistemology**
3	**-**	**multiplist epistemology**
4	**-**	**critical or evaluative thinking**

In relation to the recognition of when alternative theories were being considered an aspect of the work of Perkins et al. (1991, p. 89) in the form of 'my-side' and 'other-side' utterances were used to facilitate precision in categorisation. Perkins et al. used these descriptors as criteria for measuring completeness or bias in participants' situation modelling or naturalistic argument complexity about cognitive tasks.

Essentially, my-side arguments support a participant's initial judgement or represent a one-sided argument where alternatives to their prevailing views are not sought or generated. This type of reasoning is portrayed as incomplete, biased and represents a 'makes sense epistemology', (p. 99). Perkins et al. view this as a default epistemology, i.e. a pattern of mind which people use as the simplest, more-or-less functional, and ego-defensive form of reasoning.

Conversely, other-side arguments or utterances demonstrate opposing or competing lines of argument to the initial or prevailing one, thus complex arguments usually possess more than one theory or integration in their structure.

Kuhn (1991) also provides a similar framework for the structural analysis of peoples' theories used during their reasoning processes. Her framework identifies whether individuals' arguments reflect either a single causal structure where a single theory prevails in the reasons and conclusions or, a multiple causal structure where multiple contrasting theories are apparent in the reasons and conclusions. The content or causal dimensions of the theories in Kuhn's study as in this one are of the least importance, what is of central concern, is the nature of the arguments associated with or offered in support of those theories.

Kuhn (1991, p.22) uses the term theory not in the sense of the fulfilment of any formal scientific criteria but in the sense that theories '...make statements about the world, statements that are participant to evaluation by appeal to evidence and

argument.' She also contends that theories thus reflect a continuum from the most simplistic informal beliefs people hold to the complex and systematic formal theories advanced by scientists.

This description of the term theory has been adopted for this study given the informal and naturalistic reasoning emphasis, the abstract nature of the simulation focus, the association between the generation of alternative theories and critical thinking and the emphasis on structural as opposed to content analysis of participants' arguments.

Kuhn (1991) categorises arguments in terms of their theoretical structure in relation to whether they reflect single cause theories or multiple cause theories. The following examples are the author's interpretation of how Kuhn's categories apply to argument complexity and critical thinking in relation to the analytic framework for this study.

Single-cause theories with single causal lines

These are simple, unelaborated single-cause arguments that may constitute a single causal element as evidence for the correctness of the argument or response. Participants may elaborate the causal line descriptively in order to prolong their response, but not introduce any other discrete causal elements. This would be akin to low differentiation and low integration as previously outlined.

Single-cause theories with multiple causal lines

Single-cause theories may also include many different causal elements which are not merely sub-elements or alternations of volume along a causal dimension, i.e. more of, or less of something. Although in these cases there may be multiple causal elements identified, they are still categorised into the single-cause category because, clearly the participant uses all the causal element in contributing to an outcome or conclusion

that is attributed to one theoretical position. This is reflective of moderate differentiation and low integration in relation to integrative complexity.

Multiple-cause theories

Multiple-cause theories contrast with single-cause theories, in that they contain multiple causal elements which are not integrated into a single causal structure. Arguments of this nature include the generation or consideration of alternative contrasting theories and are, thus, considered more complex and critical.

Multiple- cause theories with multiple parallel causal lines

Theories included in this category involve multiple causal elements which in contrast to the single-cause theories give no indication that they are being integrated into a single causal structure. That is the causal elements are not clearly regarded as alternatives but merely presented successively in parallel and a terminal conclusion related to the causal elements is not evident. The responses are thus left open ended and categorised as an indication of Multiplist thinking.

Multiple-cause theories with multiple alternative causal lines

This category contrasts explicitly with the former in that the participant indicates explicitly that alternative causal structures exist or are involved. This may be signalled in linguistic terms by indicators such as:

'or'; 'on the other hand'; 'but then again'; 'also'; 'however'; 'that isn't the only'.

The alternatives generated by the participant in these cases are seen as sufficient to produce the outcome. Contrasting theories are thus contemplated as being equally likely and one is not put forward as being superior to the other in the absence of a counterargument and evaluative criteria based on evidence produced.

Kuhn also identifies the different types of genuine and non-genuine evidence used in support of participants' arguments and this was also used as a means of describing the nature of participants' reasoning in the analytic framework. This is conceived as a useful way of determining whether participants use genuine evidence routinely as a basis for their reasoning. Kuhn's categories include:

Non-evidence.

Pseudoevidence.

Correspondence.

Covariation.

Correlated change.

The categories of evidence referred to were applied to the participants' data and are described more fully in the qualitative data analytic framework presented below (Table 6.3.4). However, the following extracts from participant data sets demonstrate some examples of the above categories of evidence:

Covariation Evidence: Participant 7, Phase 2, Question 1. U2-U3.

U2 " He looked pale and drawn". (variable causal element)

U3 " and as though he didn't go out very much (variable quantity)

The participant is asserting that the degree of time outside could co-vary with skin complexion and appearance.

Correlated Change Evidence: Participant 33, Phase 2 Question 12, U3.

U3 " I mean- people who are unemployed are the most erm - unhealthy people."

In this instance, the correlation between unemployment and health brings about changes in health status that is above the norm (most unhealthy).

Counterfactual Evidence: Participant 7, Phase 3, Question 12.

U2 " If you haven't got motivation"

U3 " Then you're not gonna bother doing anything"

U4 " an that needs to be encouraged"

In this example, the absence of the external factor (motivation) leads to the non-operation of the causal antecedent, i.e. the individual will not perform any activity.

The following table demonstrates how the verbatim data was treated in relation to the analytic elements synthesised from the works aforementioned.

Assumption: Participant 7, Phase 3, Question 1, U4-U5

U4 " He does play football"

U5 " but it seemed to be like a thing he just thought of at

the last minute - sort of thing" (pseudoevidence - plausible descriptive element).

In this instance, there was no evidence to underpin the assertion in utterance 5. Billy stated in the simulation that he played football with his son regularly after school. The motive relating to the questionable accuracy of Billy's claim implicit in the utterance is thus assumed.

Table 6.3.4 Key to Qualitative Analytic Framework

Analytic Category	**Relationship to transcribed verbatim utterances**
Integrative Complexity Element (I/C)	Assignment of utterance to cognitive structural category
Differentiation (Diff)	Dimension or element of an event, concept, or phenomena
Integration (Int)	Conclusion or interaction of dimensions, in which one or more dimensions is used to relate to, or is recognised as affecting another (a relationship is inferred) Integrations may be intermediate as a means of supporting a main conclusion.
Focus	Researcher interpreted data referent
Non-evidence	Where participants imply that evidence is not necessary or irrelevant, e.g. 'it just is.' This implies that the existence of the phenomena is itself sufficient evidence that it is produced by the cause that the participant asserts (Kuhn 1991). Alternatively non-evidence may be in the form of an erroneous interpretation or assertion that is not related to the issue at hand and thus cannot contribute to the response or argument.
Pseudoevidence	A descriptive instance, or example that elaborates a theory that participants take for granted to be true, i.e. a plausible description of the causal sequence of something in the absence of a specified causal relationship, or obvious bearing upon the correctness of something. Depicts how phenomena might occur. (Descriptive element or assumption), (Kuhn 1991).
Correspondence evidence	Weakest form of direct evidence. Does no more than note an association or co-occurrence of antecedent and outcome. (Causal element) (Kuhn 1991)
Covariation evidence	Instances that represent one level of the antecedent are compared or quantified to the incidence of the outcome, i.e. as one thing varies then so does the other. (stronger direct evidence) (Causal element) (Kuhn 1991).
Boundary of Evidence	Whether the utterance is directly related to information provided by the simulation (Internal) or related to the participants personal reasoning strategies, knowledge, values beliefs etc. (External) (Kuhn 1991).
Nature of reasoning/evidence.	My-side -utterance is consistent with preceding or prevailing structure. Other-side - utterances contrasting to preceding or prevailing structure. This may be in the form of an intermediate conclusion which is independent of the preceding structure thus indicating an alternative theory. Knowledge used by participants to underpin their judgement is viewed in the context of the type of evidence reflected in utterance. (Perkins, et al. 1991; Kuhn 1991).
Counterfactual reasoning	The absence of an external factor makes the existence and operation of the causal antecedent more likely. That is, if the external factor were present, then the causal antecedent would not operate, e.g. If the prisoner had been rehabilitated he would not have re-offended. He was not rehabilitated therefore he did re-offend (Kuhn 1991).
*RC	Referent change
*SC	Structure change (other-side)
*RTPS	Return to prior structure
NFU	No Functional Uniqueness or Utility

Table 6.3.4 Continued

Analytic Category	**Relationship to transcribed verbatim utterances**
*NCA	Not Chronologically Available - information underpinning participants dimensions or integrations were not available at the time of utterance. Dimension precedes simulation sequence.
Pragmatically Useful Induction (PUI). (pre-judgement).	Inferences which appear to be based on practical everyday correspondences or associations, which may cause or affect the phenomena in question - general rules, propositions, etc. (Cheng & Holyoak 1989)
My-side conclusion	Conclusion drawn from single structure reasoning.

6.4 Participant examples of analytic process and categorisation :

Example One:

Post Judgement Stimulated Recall Question: **R.** "Did you think his exercise was regular enough?"

Table 6.4.1 Exemplification of Participant's Chain of Reasoning

Data	Integrative complexity	Focus	Boundary of Evidence	Nature of Reasoning & Evidence
U1 "No - not regular at all for himself	Int	Non- regularity of client's exercise	External	My- side conclusion.
U2 " Because people got to do it - they got to do it - 10 minutes or 15 minutes a day	Diff	Prescribed daily exercise regime	External	My-side, causal element, correspondence evidence.
U3 "But he's not neither doing walking or anything"	NFU	Erroneous interpretation	External	My-side, non-evidence
U4 " He's just a lazy person."	Diff	Subjective value judgement regarding personality characteristic	External	My-side, non-evidence.
U5 " So it's not going to happen	Int	Non probability of exercise	External	My-side conclusion.

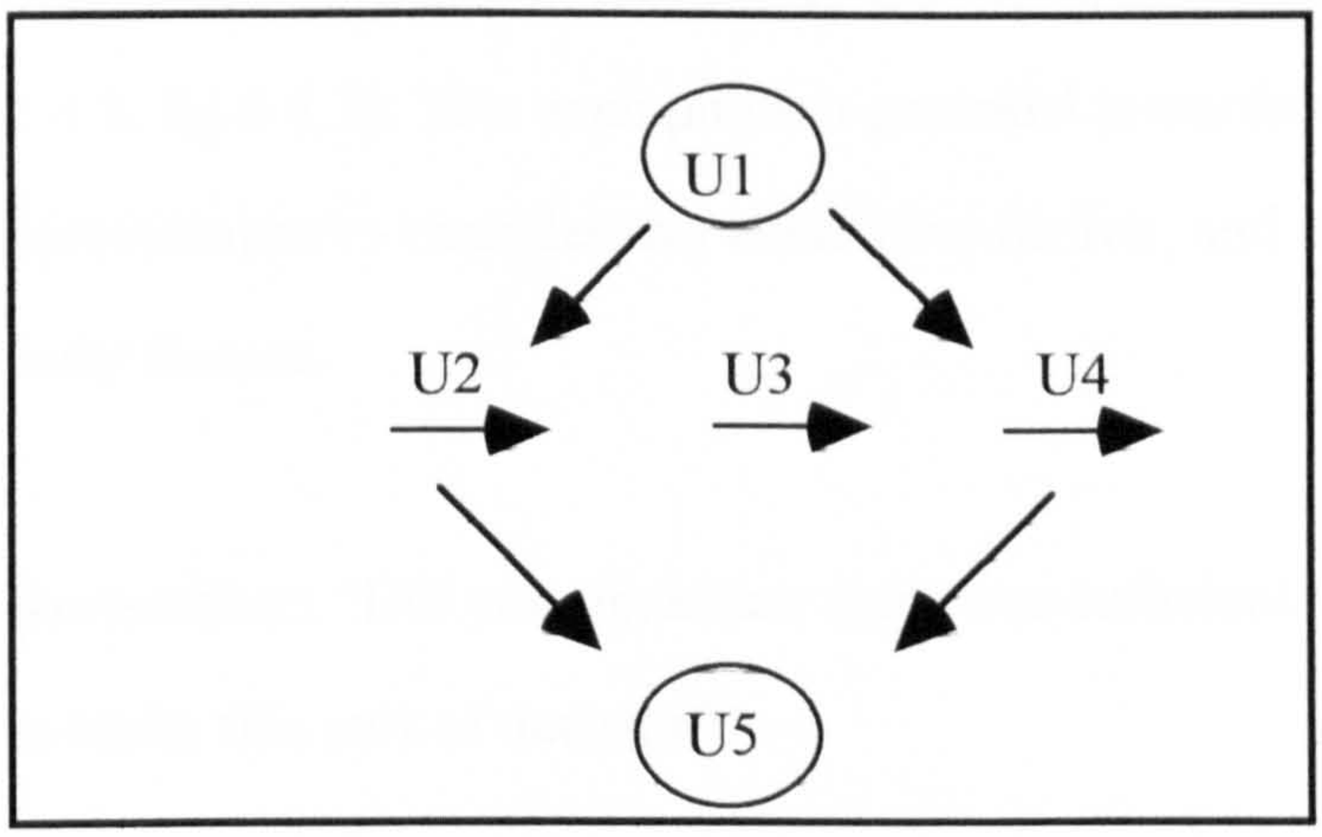


Fig. 6.4.1 *Graphic representation of Argument complexity:*

= Moderate differentiation - low Integration - , no alternatives considered

Argument complexity 1;

Situation modelling = My-side only, biased, makes sense epistemology;

Single theory structure - multiple lines, non-evidence & correspondence evidence

= Absolutist epistemology.

In this example, the participant's response starts with a conclusion which establishes their my-side position. The conclusion is supported by my-side utterances 2 and 4 which lead to the terminal conclusion, which is an extension of the initial conclusion (table 6.4.1, fig.6.4.1). Utterance 3 is an erroneous interpretation that does not contribute to the argument because Billy clearly indicates that he does exercise regularly for 1 hour per day with his son. The simulation also shows Billy walking with his friends. Thus, this response demonstrates a my-sided single theory structure which asserts that Billy does not exercise regularly. No alternatives are considered this thus facilitates the above argument complexity categorisation.

Example Two: Post Judgement Test for Adequacy

In this example, although the participant does generate an alternative theory that contrasts to the prevailing limited information structure in U8 this is immediately overlooked in favour of a return to the prevailing limited information structure (table 6.4.2, fig.6.4.2). This exemplifies a potential towards multiplist thinking but not the perseverance to consider this alternative further, and a naturalistic tendency towards early closure.

Researcher: "Did you think that there was sufficient information there to enable you to make this sort of decision?"

Table 6.4.2 Example two, Participant's: Chain of reasoning

Data	**Integrative complexity**	**Focus**	**Boundary of Evidence**	**Nature of Reasoning and Evidence.**
U1 No - not really - I don't think so	Int (My side-established)	Insufficiency of evidence	External	My-side conclusion
U2 I saw him walking just in town.	Diff	visual evidence of one locus of activity	Internal	My - side, descriptive element, pseudoevidence
U3 It didn't give you very much about his lifestyle	Diff	Insufficiency of lifestyle information	External	My -side, descriptive element, pseudoevidence
U4 I didn't hear his wife talk at all	Diff	Absence of verbal information from Billy's wife	Internal	My -side, descriptive element, pseudoevidence
U5 didn't see the other children	Diff	No visual information regarding the other children	External	My -side, descriptive element, pseudoevidence
U6 If you – got to know him - I mean he might be referred by the doctor to need psychiatric – perhaps just to talk like the Community Psychiatric Nurse - I'm sure you'd get to know more - and offer more advice by actual contact	Diff	possibility of improved information gathering and advising in a clinically -specific nursing interaction (CPN).	External	My-side, causal element, Counterfactual reasoning, correspondence evidence.
U7 So I think it was quite limiting really	Int	Limitations of information available	External	My -side conclusion.
U8 *S.C. Although you can pick up a lot	Diff (high)	Alternative possibility of significant information acquisition	External	Other - side, descriptive element, pseudoevidence
U9 * RTPS I don't think there was enough - really if you re making serious decisions	Int	Limitations of information for serious decision making	External	Return to prior my -side conclusion.

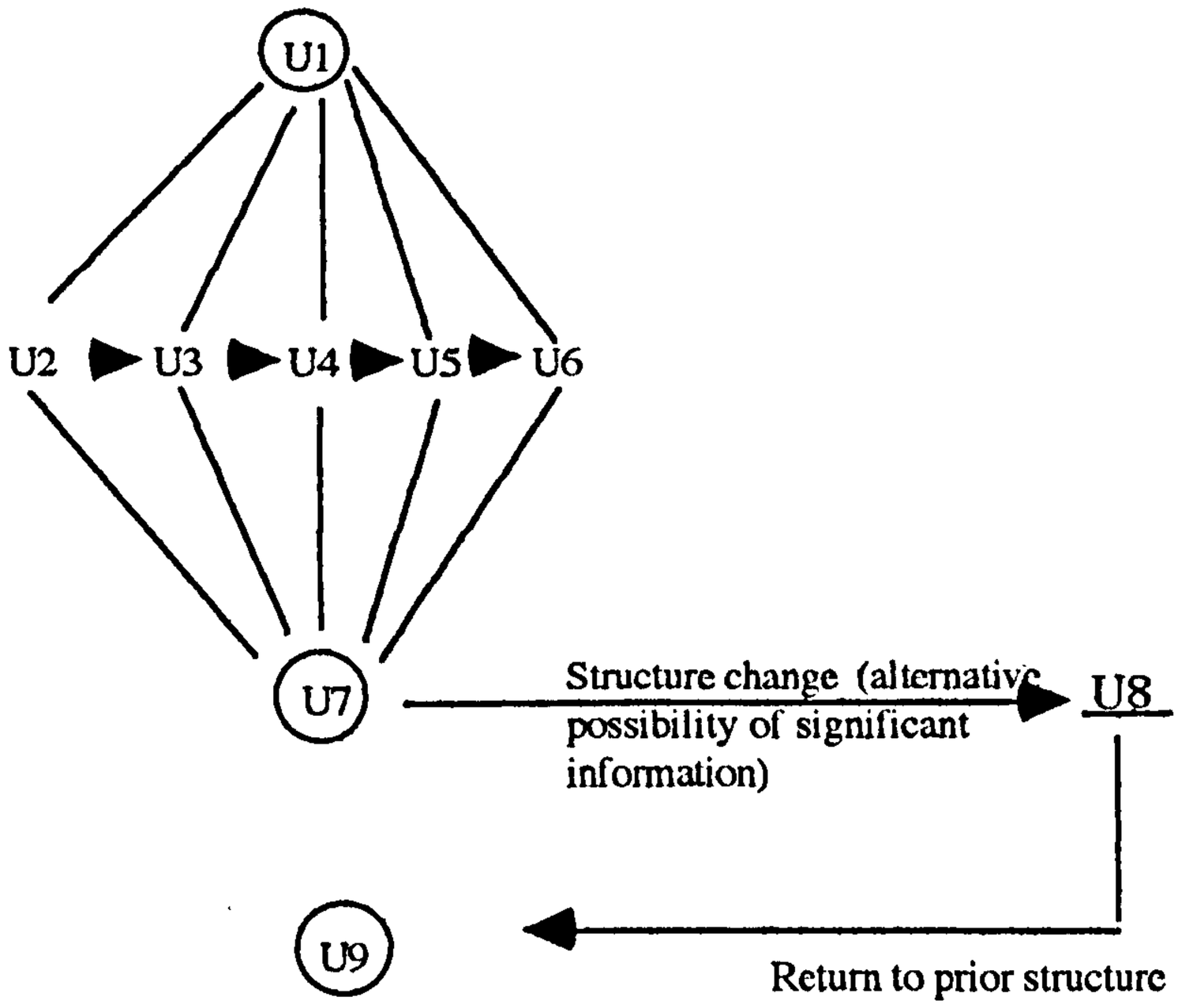


Fig. 6.4.2 Example 2 - Cumulative Structure.

Moderate - high differentiation

Low integration = Argument complexity 2

Situation Modelling - predominantly biased my-side prevails = Makes Sense

Epistemology.

Single theory structure prevails , alternative theory ignored - multiple lines,

- psuedo, correspondence

- counterfactual evidence,

Potential Multiplist Epistemology

Example 3: Post Simulation Judgement.

This example clearly represents an extended response which is rich in dimensions, referent changes, intermediate conclusions and the absence of a terminal main conclusion. The first part of the response comprises a large number of dimensions that support an unfolding my-side structure directed towards disagreement with Billy's personal view, that he is not unhealthy (U1 - U18). There are, however, two structural changes which appear to contrast with this prevailing structure. U19 contrasts with the prior structure by alternatively suggesting that Billy does not exhibit any indicators of ill-health or need for hospital based health care intervention. U20 then indicates a return to the prior structure by suggesting that, although there are no current ill-health indicators, there may be some in the long term. This is then supported by several dimensions and intermediate conclusions (U21 - U24). There appears to be another other-side structural change at U25 which suggests that while Billy may not be as healthy as he believes, he is not, however, the author of any health problems. U27 appears to support this structure and functions as a counterfactual element, i.e. there was no evidence of Billy smoking (absence of an external antecedent, thus the causal antecedent of Billy contributing to any ill-health does not operate) so "he is not trying to sort of feel ill." This other-side structure is further supported by U28 - U30 and finally concludes with two repetitive dimensions and no main conclusion (table 6.4.3, fig. 6.4.3). This represents an open-ended response which is not integrated into any prevailing single theory structure, alternatives are considered and the response thus merits a multiplist epistemology categorisation.

Researcher (R). ***Structured Question:*** Would you agree with Billy then, is he Healthy?

Table 6.4.3 Example three Participant's: Chain of Reasoning

Data	**Integrative complexity**	**Focus**	**Boundary of Evidence**	**Nature of reasoning and evidence**
U1. Billy didn't think himself unhealthy	Diff	Billy's opinion of personal health status	Internal	My-side, descriptive element Psuedoevidence
U2. *RC- But I think that erm - he obviously - erm - there seemed a lot of strain between the wife and Billy	Diff	possible marital conflict	External	My-side, Causal element, Correspondence E.
U3. He's there a lot	Diff	Billy's degree of presence	External	My-side, Causal element, Correspondence E.
U4. He doesn't mention that he helps his wife - in anything around the house	Diff	Absence of self reported domestic assistance	Internal	My-side, Causal element, Correspondence E.
U5. *RC - So she appeared to have the attitude - well as long as you're out of my way - an not doing something – then y'know.	Int	Conclusion regarding wife's attitude towards Billy's behaviour	External	My-side conclusion, Correspondence E.
U6. She did all - dealt with the children	Diff	Wife as sole child care	External	My-side, Descriptive element, Psuedoevidence.
U7. Anything around the house	NFU	-	-	-
U8. Did the shopping	Diff	Wife as sole procurer of family supplies	Internal	My-side, Descriptive element, Psuedoevidence
U9. *RC- He felt he was keeping himself healthy	NFU	-	-	-
U10. Busying himself with his own- er interests	Diff	personal interests as means of occupying time	External	My-side, Causal element, Correspondence E.
U11. He didn't seem to get out much an exercise	Diff	Apparent lack of exercise	External	My-side, Causal element, Correspondence E.
U12. But we only saw him in the living room	NFU (Utility)	-	-	-
U13. So we can't really - I mean that's a quick judgement	NFU	-	-	-
U14. *RC – He seemed very much into himself	Diff	Introversion/ self-centred	External	My-side, Descriptive element, Psuedoevidence.
U15. Not socialising	Diff	As utterance	External	My-side, Causal element, Correspondence E.
U16. Not going out to work - mixing with your mates	Diff	Unemployment related isolation	External	My-side, Causal element, Correspondence E

Data	Integrative Complexity	Focus	Boundary of Evidence	Nature of reasoning and Evidence
U17. Having the money to socialise afterwards	Diff	Financially related isolation	External	My-side, Causal element, correspondence E.
U18. When you're in the house- you must become – isolated really and I think that came across	Int	Domestic isolation	External	My-side conclusion, Correspondence E.
U19. *SC – So on the outside - an seeing him sit in the chair - an just chatting away - you wouldn't actually - you wouldn't immediately - think - erm – you might - say he doesn't actually need hospital treatment or accident and emergency or anything cropping up	Int	Absence of overt ill-health.	Internal	Other-side conclusion, (Structure change to support Billy's perspective).
U20. *RTPS - but it could be that there's more long term effects	Diff	Speculative long term health effects of Billy's situation on his health	External	Return to my-side, Descriptive element, Psuedoevidence.
U21. Six years unemployment is quite a long time	Diff	Perceived longevity of unemployment period	External	My-side, Descriptive element, Psuedoevidence.
U22. The unemployed become unemployable – because – well obviously there's loads of factors affecting it - the area - if there isn't high employment	Int	Conclusion regarding employability of the unemployed with example of context.	External	My-side conclusion, Correspondence E.
U23. He seemed to have high hopes in computers	Diff	Billy's high aspirations in computer sector	Internal	My-side, Descriptive element, Psuedoevidence.
U24. But often the case is that younger people - come in from - with higher education - go into computers an the actual computer base for jobs is getting smaller – because computers by their nature - make for not so many – manpower needed.	Int	Reduced computer career opportunities for older people.	External	My-side conclusion (maintaining opposition to Billy's perceived health - Structure)
U25. *SC – He is not trying to sort of feel ill.	Int	Billy's non-contribution to own ill-health.	External	Other-side conclusion, (Billy may not be trying to be unhealthy - Structure).
U26. An be sorry for himself	Diff	Self-pity	Internal	My-side, Causal element, Correspondence E.

Data	Integrative Complexity	Focus	Boundary of Evidence	Nature of Reasoning and Evidence
U27. It didn't mention if he smoked or not	Diff	Absence of smoking evidence	Internal	My-side, Descriptive element (? counterfactual) Psuedoevidence.
U28. Stress and smoking and drinking an – not being happy as in feeling fulfilled -	Diff	Examples of ill -health causal factors	External	My-side, Descriptive element, Psuedoevidence.
U29. Can lead to quite a few - y'know feeling bad – quite a few sort of cases of illnesses - I mean Coronary Heart Disease.	Int	possible effect of above ill-health causal factors.	External	Other-side conclusion, Descriptive elements Psuedoevidence.
U30. The statistics say - it's er - an it's quite a bit in Glasgow	Diff	Geographically related evidence to support preceding conclusion.	External	My-side, Causal element, Covariation E.
U31. That lifestyle can add to that sort of thing	NFU	-	-	-
U32. I mean apparently he looked quite well	NFU (U19)	-	-	-

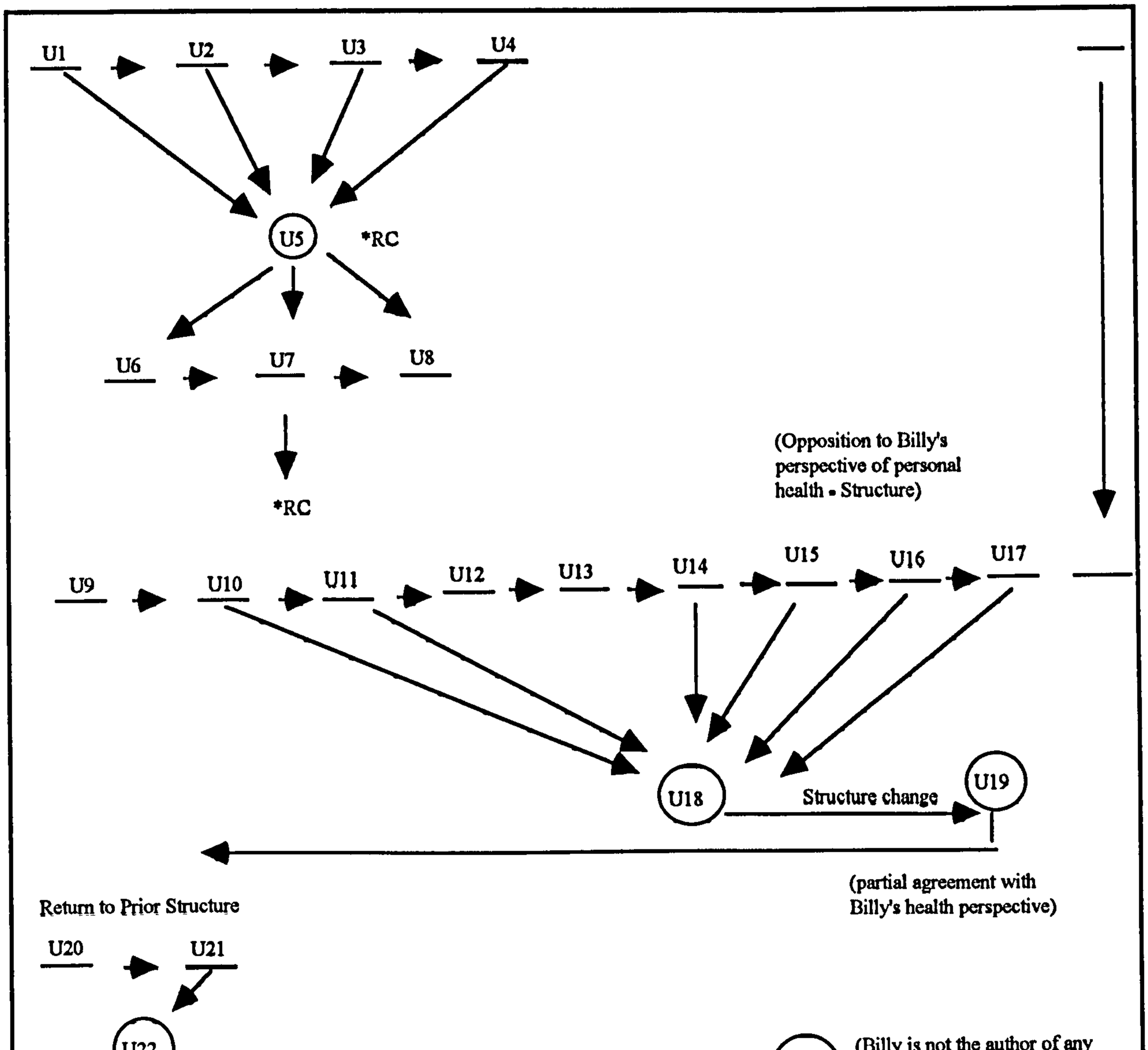


Fig. 6.4.3 Example 3 - Cumulative Reasoning Structure

Moderate to high differentiation - moderate integration

= Argument Complexity 3

Situation Modelling - unbiased, my-side & other-side,
= Critical Epistemology.

Alternative Theory Structure - multiple lines;

- pseudo, correspondence, & covariation evidence;

- counterfactual reasoning;

= Multiplist Epistemology.

In summary, this chapter has outlined the development and implementation of the analytic methods utilised in testing the aim of identifying evidence of critical thinking. It has endeavoured to clarify the decision making process in the development of the analytic framework and produce an audit trail with examples of data presentation and argument complexity categorisation.

The next chapter will present the study findings. Participant case studies will incorporate the description of participants' critical reasoning in relation to the analytic framework developed and their Watson & Glaser Critical Thinking Appraisal (1991) pretest and post test scores.

CHAPTER SEVEN

RESULTS

Introduction

The purpose of this chapter is to present and describe the results of the data analysis and important observations for the four phases of longitudinal data. Further examination of the findings and important observations will be dealt with in the following discussion chapter.

The results or the WGCTA for phases 1 and 4 will be presented first in relation to: the frequency distribution of raw scores; the longitudinal differences in group mean raw scores for the untimed (RSU) WGCTA as a whole; followed by sub-test longitudinal mean raw scores and norm table comparisons. Further bivariate analyses will be presented with particular reference to relevant participant demographic variables and their relationship to the group scores.

7.1 Frequency Distributions of WGCTA Raw Scores for Phases 1 & 4. Figures 7.1.1 and 7.1.2 show the frequency distribution of participant test scores on the untimed WGCTA test. Table 7.1.1 represents a normal distribution of scores for phase1, although the distribution of scores for phase 4 was bi-modal (Table 7.1.2). The mean scores for phases 1 and 4 were nonetheless considered amenable to parametric testing.

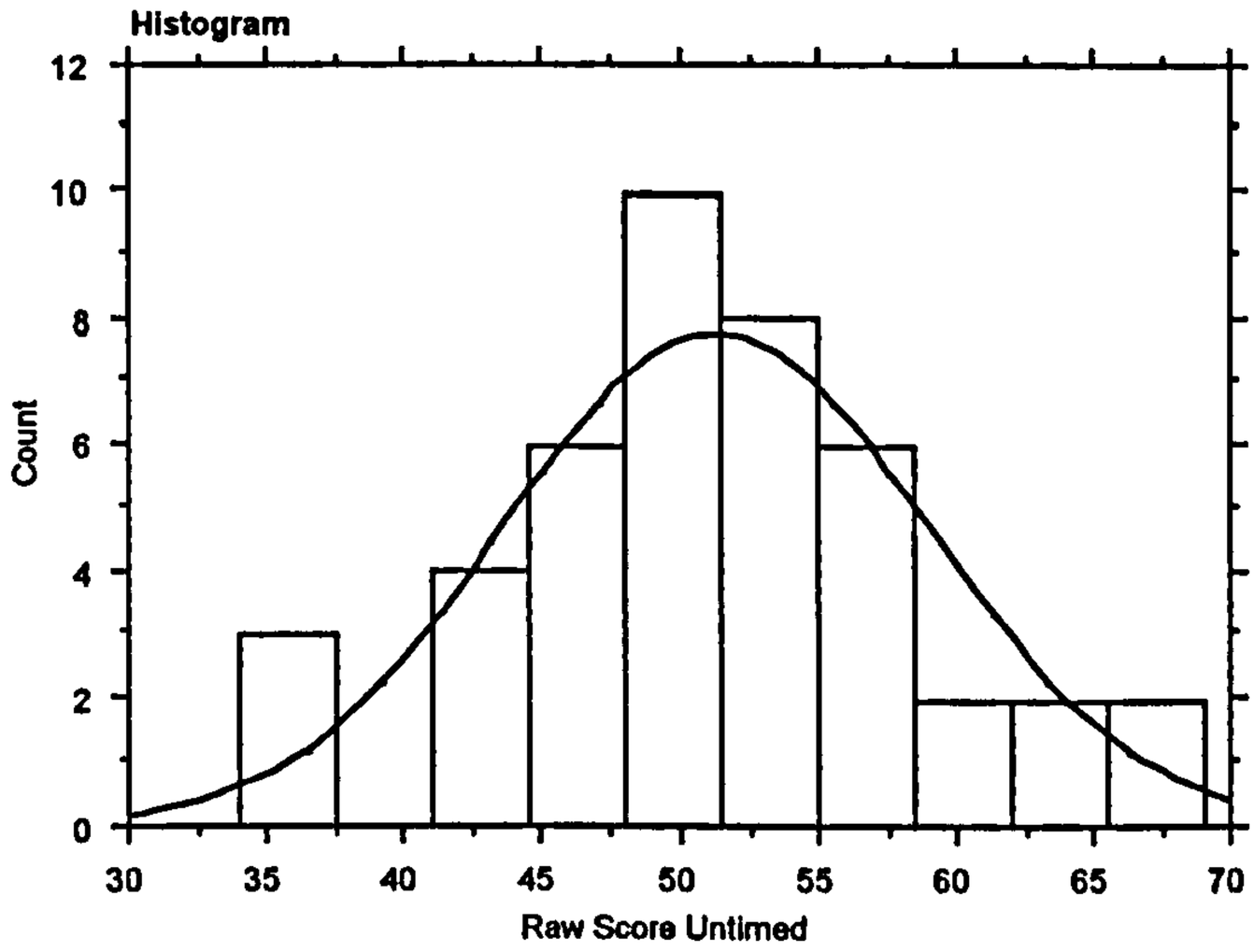


Fig. 7.1.1 Frequency Distribution of Raw Score Untimed (RSU) phase 1.

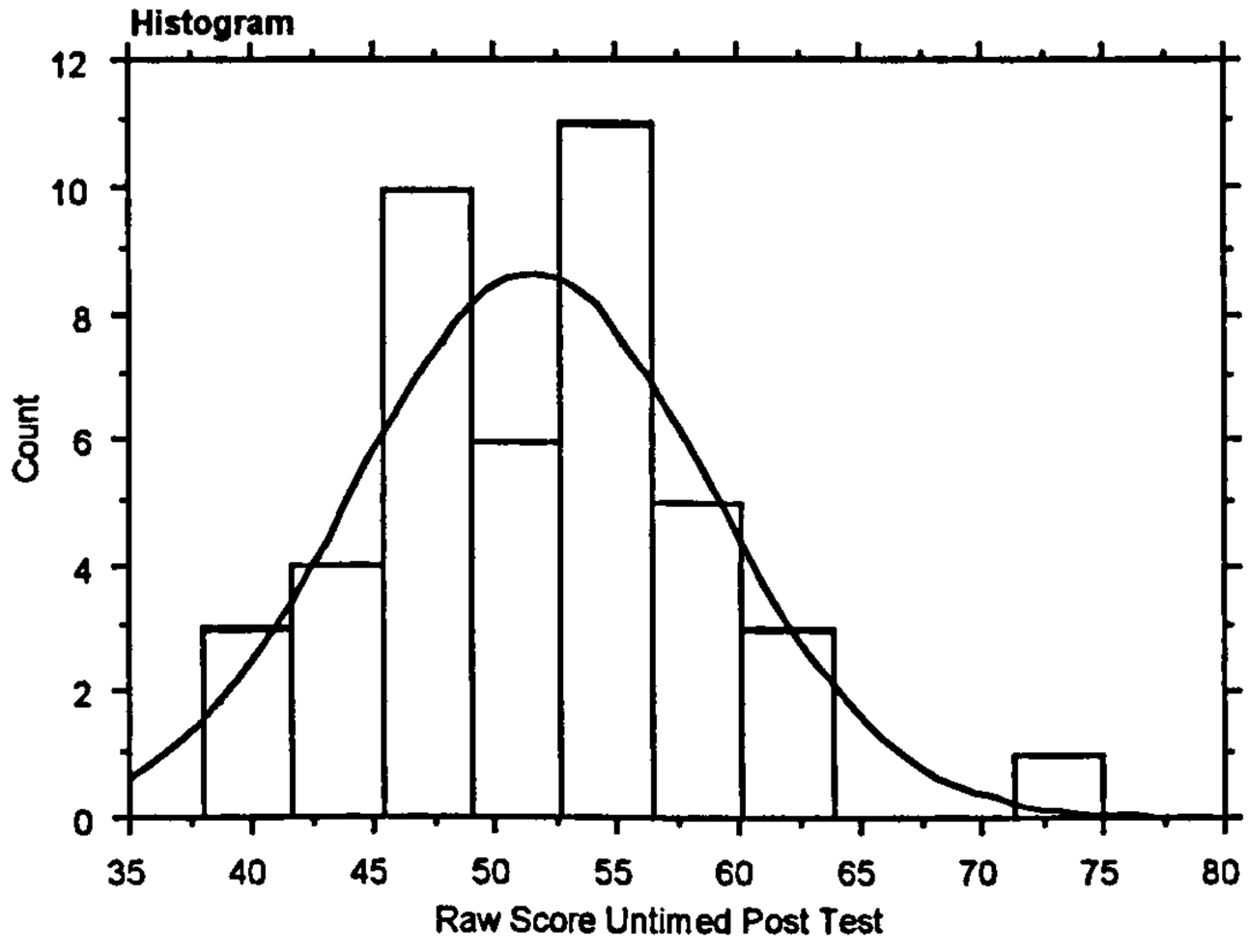


Fig. 7.1.2 Frequency Distribution for Raw Score Untimed Post Test (RSU/P) Phase 4.

7.2 Comparisons of Phase 1 Raw Score untimed(RSU) & Phase 4 Raw Score Untimed Post Test (RSU/P) Mean WGCTA Raw Scores.

A Paired t-test was deemed appropriate for this purpose given that the intention was to compare two measurements taken from the same experimental unit at different times (Haycock et al. 1994) and that the assumptions underpinning parametric testing were broadly met.

Table 7.2.1 WGCTA Mean Untimed Raw Scores: Phases 1 & 4 (n=43)

	Phase 1	Phase 4	Difference
Minimum	34	38	+4
Maximum	69	75	+6
Mean	51.349	51.605	+.256
Std Deviation	7.721	7.320	-0 .401
Std Error	1.177	1.116	- 0.61
Variance	59.614	53.578	- 6.036

Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
RSU, RSU/P	-.256	42	-.265	.7920

Fig.7.2.1 Paired T-Test for Mean Raw Scores: Phases 1&4.

The differences in mean scores for phases 1&4 did not achieve statistical significance in test performance. This suggests that by the end of the common foundation programme the group's critical thinking abilities as measured by the WGCTA showed no change from that shown at the outset of the course.

One difference worthy of note is that of group test completion times between phases 1 and 4. At phase 1 the observed test completion times ranged between 40 minutes

and 79 minutes. These were not recorded individually due to the untimed nature of the test. At phase 4, however, 36 participants had completed by 40 minutes mark leaving just seven participants continuing to a maximum of 51 minutes. On this evidence it appears that the group achieved the same score, albeit in a shorter time, generally or that they reached the same conclusions more quickly. Given that the pre and post tests were almost eighteen months apart the possible transfer of skills from the first administration to the second should not apply (Rust & Golombok, 1989). There are several possible explanations for this, in that the participants were bored with the test, they may have valued the outcomes less or they were more confident with assessment events given their progression through the programme. These results also lend some support to the author's claims that the test is one of power and not necessarily speed.

7.3 Comparisons of WGCTA Sub-Test Scores for Phases 1&4.

Watson & Glaser (1991) do not advocate the use of the test's part scores to evaluate individual attainment. This is due to the insufficient reliability of what is a relatively small number of items when making judgements about individual performance. They do, however, suggest it is feasible to use these for groups in a training context to illuminate appropriate training in aspects of critical thinking based upon such analyses. In this instance, the part scores are presented below to determine whether longitudinal differences existed in the group's sub-test scores of critical thinking and as a basis for comparison to the verbal report analysis for phases 2 and 3.

Table 7.3.1 WGCTA Inference Sub-Test Scores: Phases 1&4 (n=43)

Sub-test - INFERENCE	Phase 1	Phase 4	Difference
Minimum	5	3	-2
Maximum	14	14	0
Mean	8.488	8.372	- .116
Std Deviation	2.443	2.601	+ .158
Std Error	.373	.397	+ .24
Variance	5.970	6.763	+ .793

Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
Inference, Inference/p	.116	42	.309	.7592

Fig. 7.3.1 Paired t-test for Inference (phase 1) & Inference (Post test, phase 4).

Table 7.3.2 WGCTA Sub-Test Scores: Phases 1&4 (n=43)

Sub-test - RECOGNITION OF ASSUMPTIONS	**Phase 1**	**Phase 4**	**Difference**
Minimum	6	4	- 2
Maximum	15	16	+1
Mean	10.953	11.140	+ .187
Std Deviation	2.182	2.660	+ .478
Std Error	.333	.406	+ .073
Variance	4.760	7.075	+ 2.315

Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
Rec of Ass, Rec of Ass/p	-.186	42	-.428	.6705

Fig. 7.3.2 Paired t-test for Recognition of Assumptions (phase 1) & Recognition of Assumptions (Post test, phase 4)

Table 7.3.3 WGCTA Deduction Sub-Test Scores: Phases 1&4 (n=43)

Sub-test - DEDUCTION	**Phase 1**	**Phase 4**	**Difference**
Minimum	3	4	+1
Maximum	15	16	+1
Mean	8.953	9.163	+.1.10
Std Deviation	2.627	2.419	- .208
Std Error	.401	.369	-.032
Variance	6.903	5.854	- 1.049

Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
Deduction, Deduction /p	-.209	42	-.445	.6584

Fig. 7.3.3 Paired t-test for Deduction (phase 1) & Deduction (Post test, phase 4).

Table 7.3.4 WGCTA Sub-Test Scores: Phases 1&4 (n=43)

Sub-test - INTERPRETATION	**Phase 1**	**Phase 4**	**Difference**
Minimum	6	8	+2
Maximum	16	16	0
Mean	12.233	12.116	-0.117
Std Deviation	2.182	1.979	- 0.203
Std Error	.333	.302	0.031
Variance	4.754	3.915	0.839

Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
Interpret, Interpret/p	.116	42	.443	.6600

Fig. 7.3.4 Paired t-test for Interpretation (phase 1) & Interpretation (Post test, phase 4)

Table 7.3.5 WGCTA Sub-Test Scores: Phases 1&4 (n=43)

Sub-test - EVALUATION OF ARGUMENTS	**Phase 1**	**Phase 4**	**Difference**
Minimum	6	6	0
Maximum	15	16	1
Mean	10.721	11.000	0.279
Std Deviation	2.271	2.278	0.007
Std Error	.346	.347	0.001
Variance	5.158	5.190	0.032

Paired t-test
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
Eval of Arg, Evl of Arg/p	-.279	42	-.713	.4798

Fig. 7.3.5 Paired t-test for Evaluation of Arguments (phase 1) & Evaluation of Arguments (Post test, phase 4)

The conclusions to be drawn from the above sub-test comparison of mean scores is that the differences do not achieve significance at the =0.05 level and the data are in line with the results of the total raw score mean comparisons. Overall these scores suggest that participants' performance in the components of critical thinking as measured by the WGCTA showed no difference at the end of the Common Foundation Programme (CFP).

To place these scores in a broader context a selection of norm tables are presented (tables 7.3.6 - 7.3.11). These tables include examples of comparative group mean scores. This concurs with Watson & Glaser's (1991) suggestion that test users

compare results with norms of occupational groups that most closely resemble the group being tested. Because of the high correlation coefficient between forms B & C (r = .95) appropriate occupational groups that were tested using form B will be included.

Table 7.3.6 Norm Table 27: Sixth Form Grammar school Pupils in the UK (Watson & Glaser 1991, p. 99).

Form	Sample	Test Type	Mean	S.D.	S.E.M.
B	n = 127	Timed	55.1	10.4	5.4

Table 7.3.7 Norm Table 36: Combined Sixth Form Grammar School Pupils in UK (Watson & Glaser 1991, p. 108).

Form	Sample	Test Type	Mean	S.D.	S.E.M.
C	n = 108	Timed	57.7	8.3	2.9

An international comparison is available although the academic levels of the programmes differ (undergraduate as opposed to diploma level).

Table 7.3.8 Norm Table 17: Nursing Students in Baccalaureate Programs at Universities in Southern USA (Watson & Glaser 1991, p. 89).

Form	Sample	Test Type	Mean	S.D.	S.E.M.
A & B	n = 266	Timed	56.0	7.3	3.8

Table 7.3.9 Norm Table 18: Nursing Students in Baccalaureate programs at Universities in western USA (Watson & Glaser 1991, p. 90).

Form	Sample	Test Type	Mean	S.D.	S.E.M.
A & B	n = 182	Timed	56.4	9.1	4.7

Table 7.3.10 Norm Table 19: Nursing Students in Baccalaureate Programs at Universities in midwestern USA (Watson & Glaser 1991, p.91).

Form	Sample	Test Type	Mean	S.D.	S.E.M.
A & B	n = 203	Timed	59.8	7.5	3.9

Table 7.3.11 Norm Table 25: Nursing Students in a Baccalaureate Program at a University in southern USA (Watson & Glaser 1991, p. 97).

Form	Sample	Test Type	Mean	S.D.	S.E.M.
A & B	n = 266	Timed	56.0	7.3	3.8

The above norm tables thus demonstrate that the study group's level of performance in the WGCTA is lower than some comparable but not equivalent international groups particularly for an untimed test. Comparisons with the United Kingdom norm tables are generally what would be expected given the differing academic levels (A level versus O level).

7.4 Further Bivariate Analyses.

Bryman & Cramer (1997) suggest that bivariate analysis can contribute to the process of theory development in relation to the phenomena under investigation by exploring the possible relationships between different pairs of variables. For this purpose several such variables were examined at phases 1 and 4. The WGCTA record form includes data on the demographic variables of age, gender and ethnic group membership. An additional variable in the form of entry qualifications at entry to the programme were provided by student enrolment data Unfortunately, ethnicity, gender, and entry qualification could not be used as independent variables in this analysis because the numbers of participants within each discrete category resulted in an insufficient representation within the study group to make judgements about meaningful relationships. Figs 7.4.1, 7.4.3 and 7.4.5 demonstrate that the population was dominated by white females who entered the programme via the 5 O Level route. Figs 7.4.2 & 7.4.4, and 7.4.6 provide further evidence of this and present comparisons of mean raw scores and error bars for the same demographic variables.

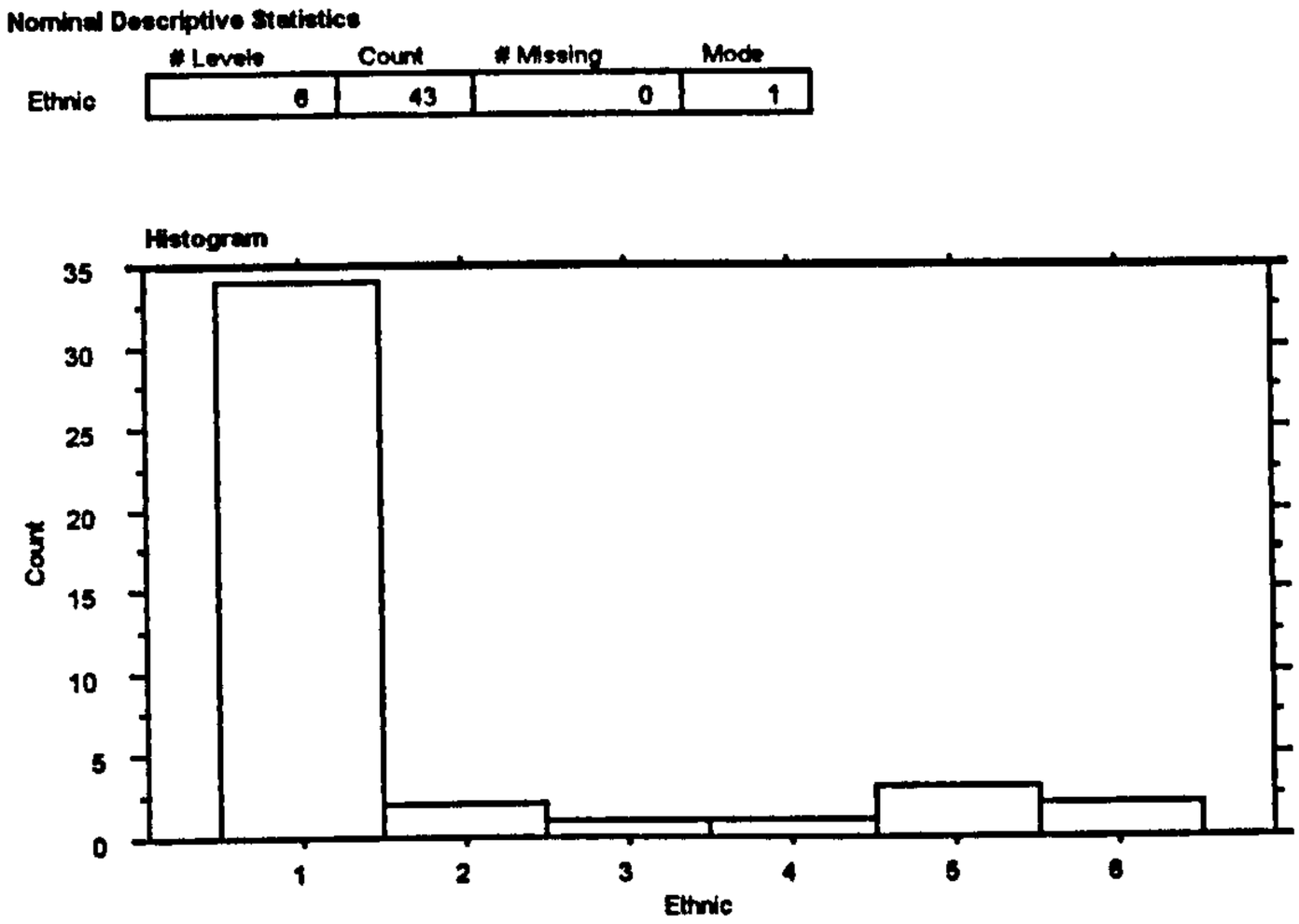


Fig. 7.4.1 Frequency Distribution of Participant Ethnicity.

Key:

1 = White
2 = Black African
3 = Black Caribbean
4 = Chinese
5 = Indian
6 = Mauritian

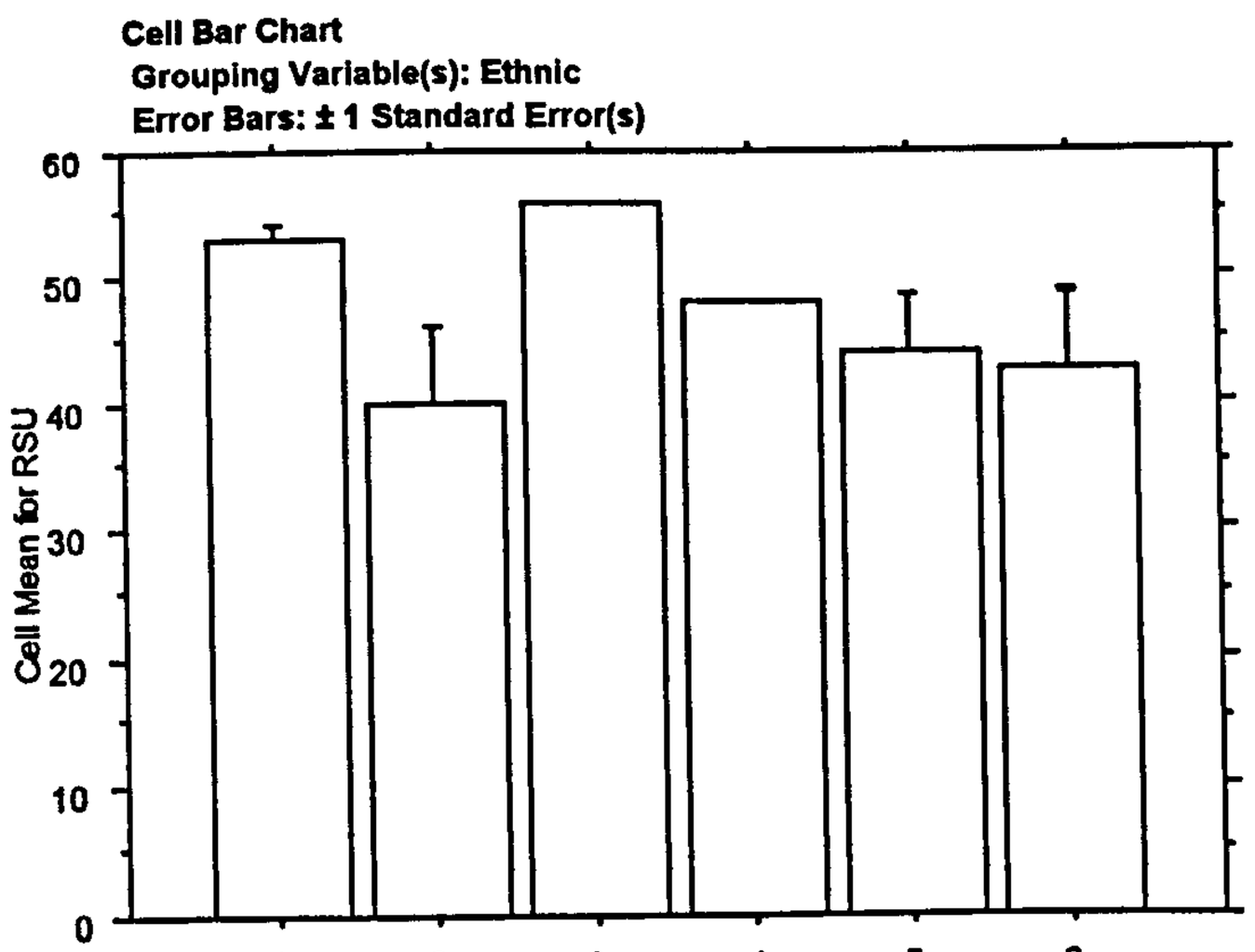


Fig. 7.4.2 Cell Plot: Raw Score Untimed and Group Ethnicity.

Key:

1 = White 3 = Black Caribbean 5 = Indian

2 = Black African 4 = Chinese 6 = Mauritian

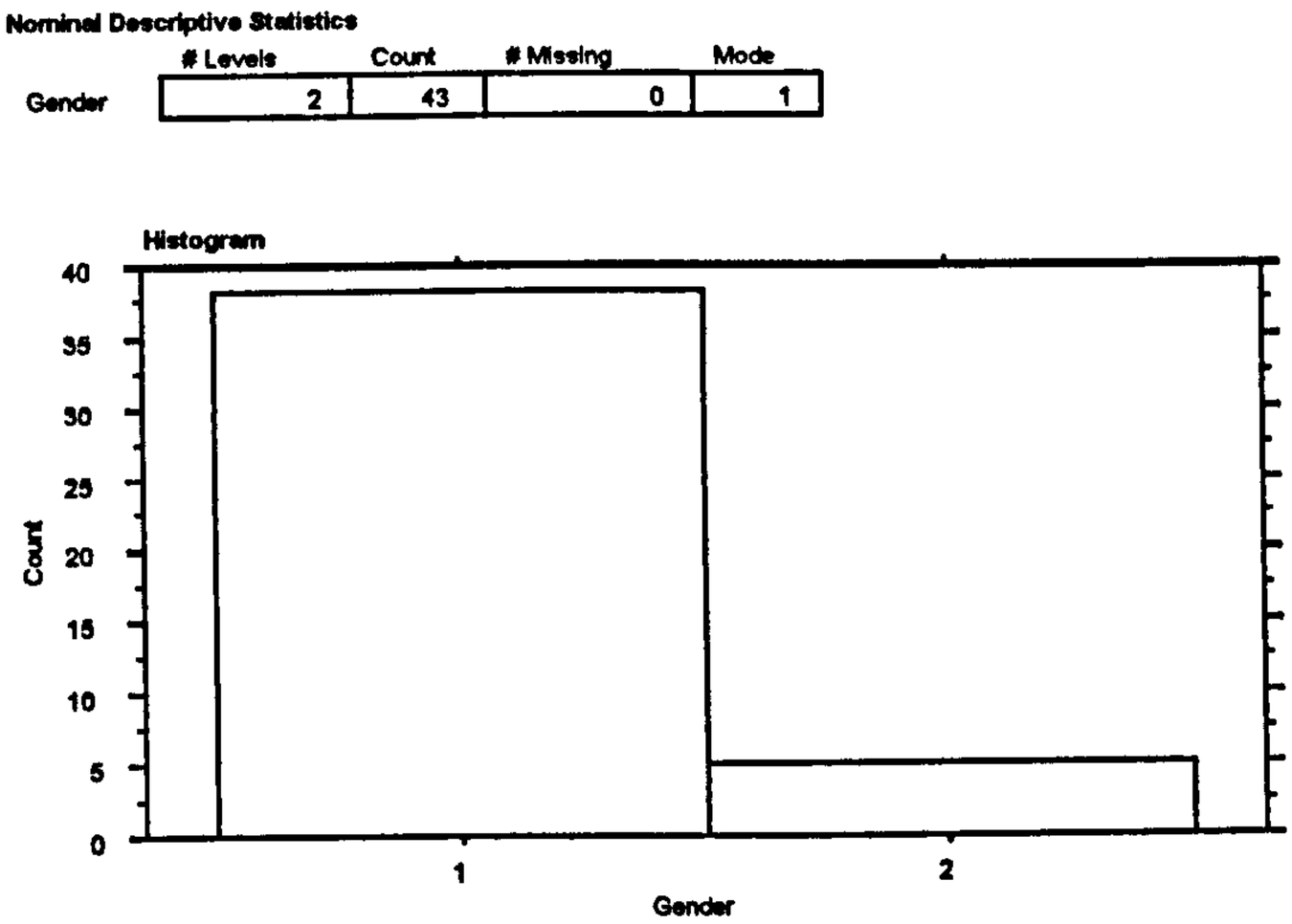


Fig. 7.4.3 Descriptive Statistics for Group Gender (1 = Female 2 = Male).

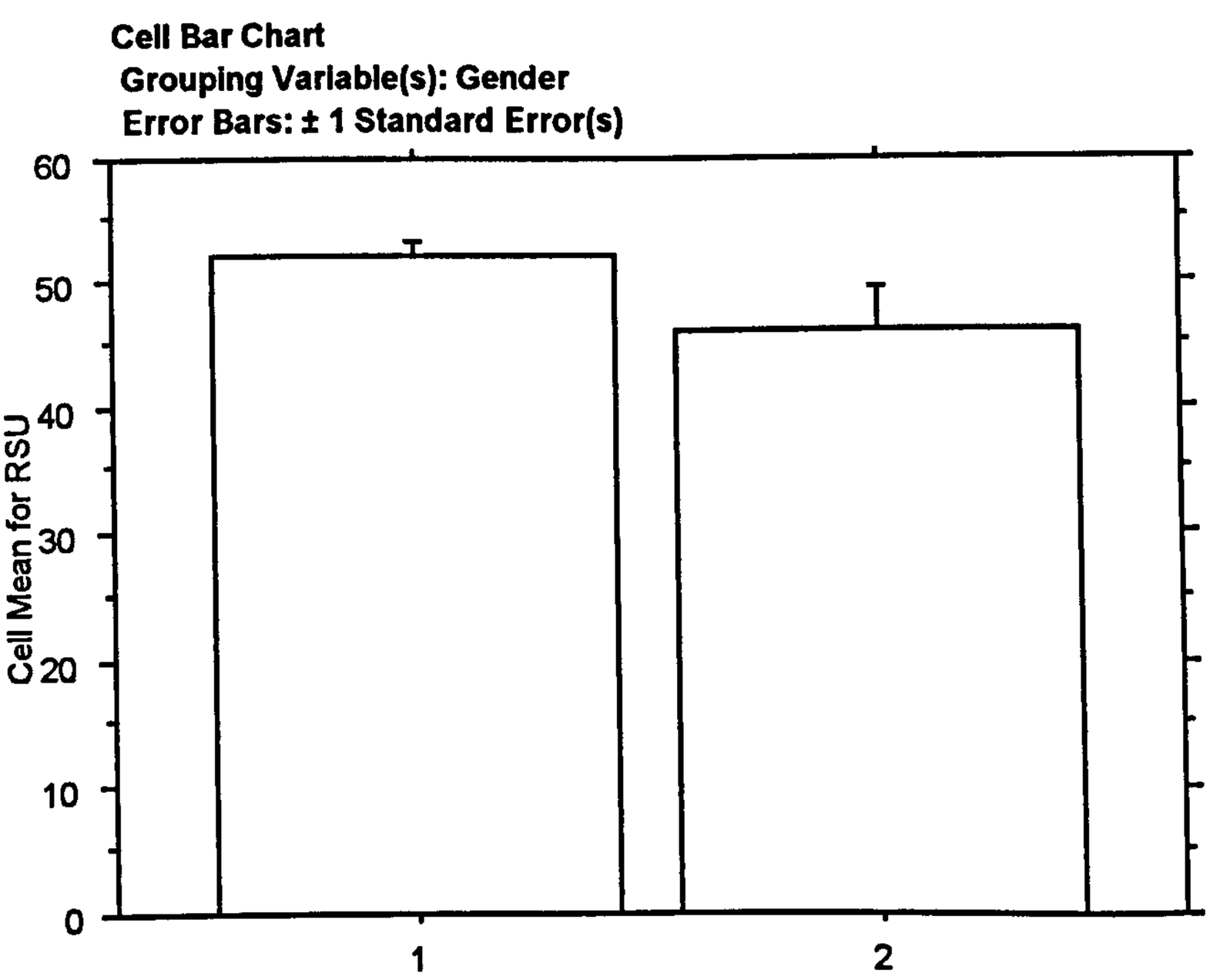


Fig. 7.4.4 Cell Plot Raw Score Untmed (RSU) & Gender (1 = Female, 2 = Male).

Nominal Descriptive Statistics

	# Levels	Count	# Missing	Mode
EQual	3	43	0	1

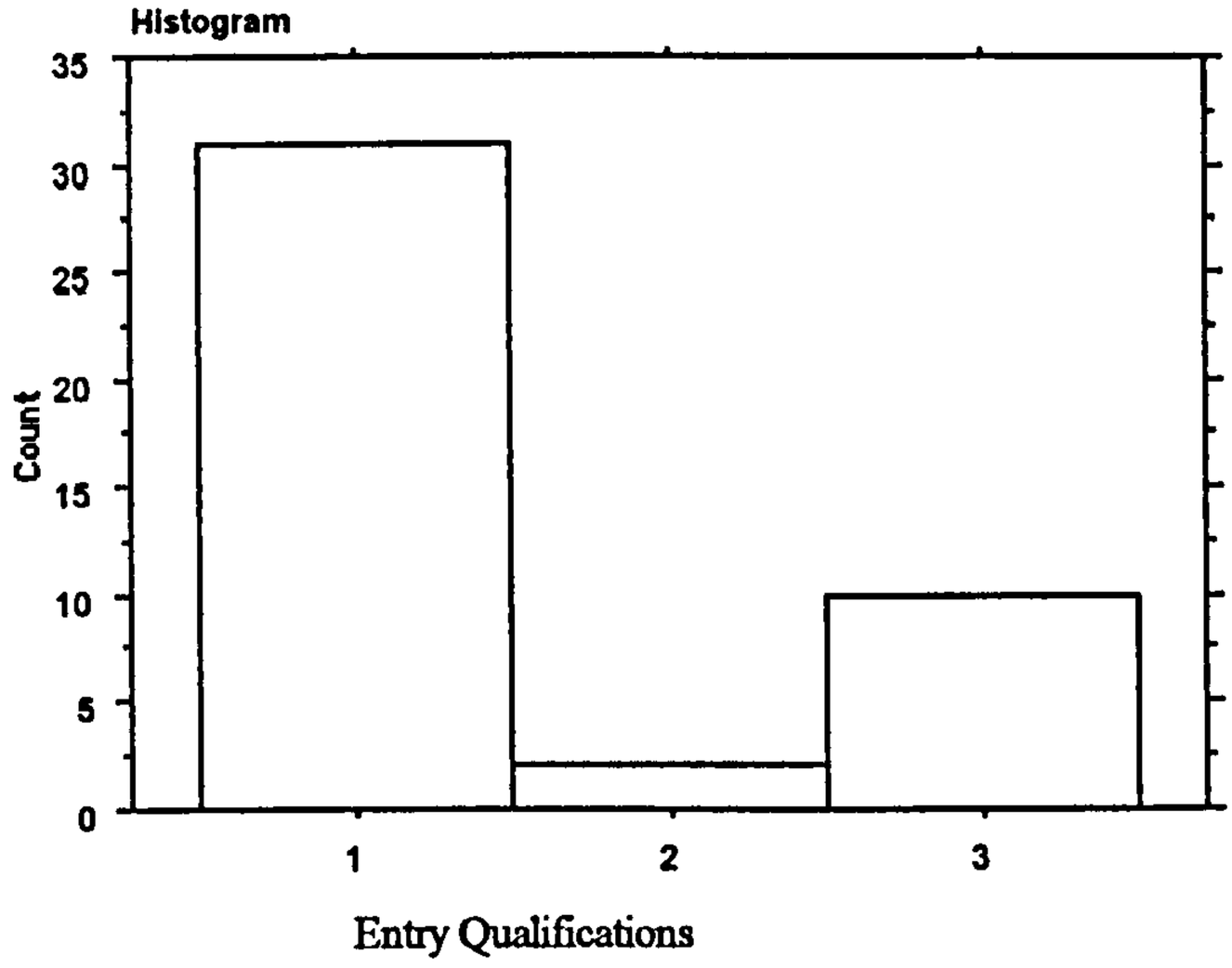


Fig. 7.4.5 Descriptive Statistics: Group Entry Qualifications Categories.
1 = 5 O Levels
2 = O Levels & A Levels
3 = Informal Qualifications (DC Test, Access course, BTEC)

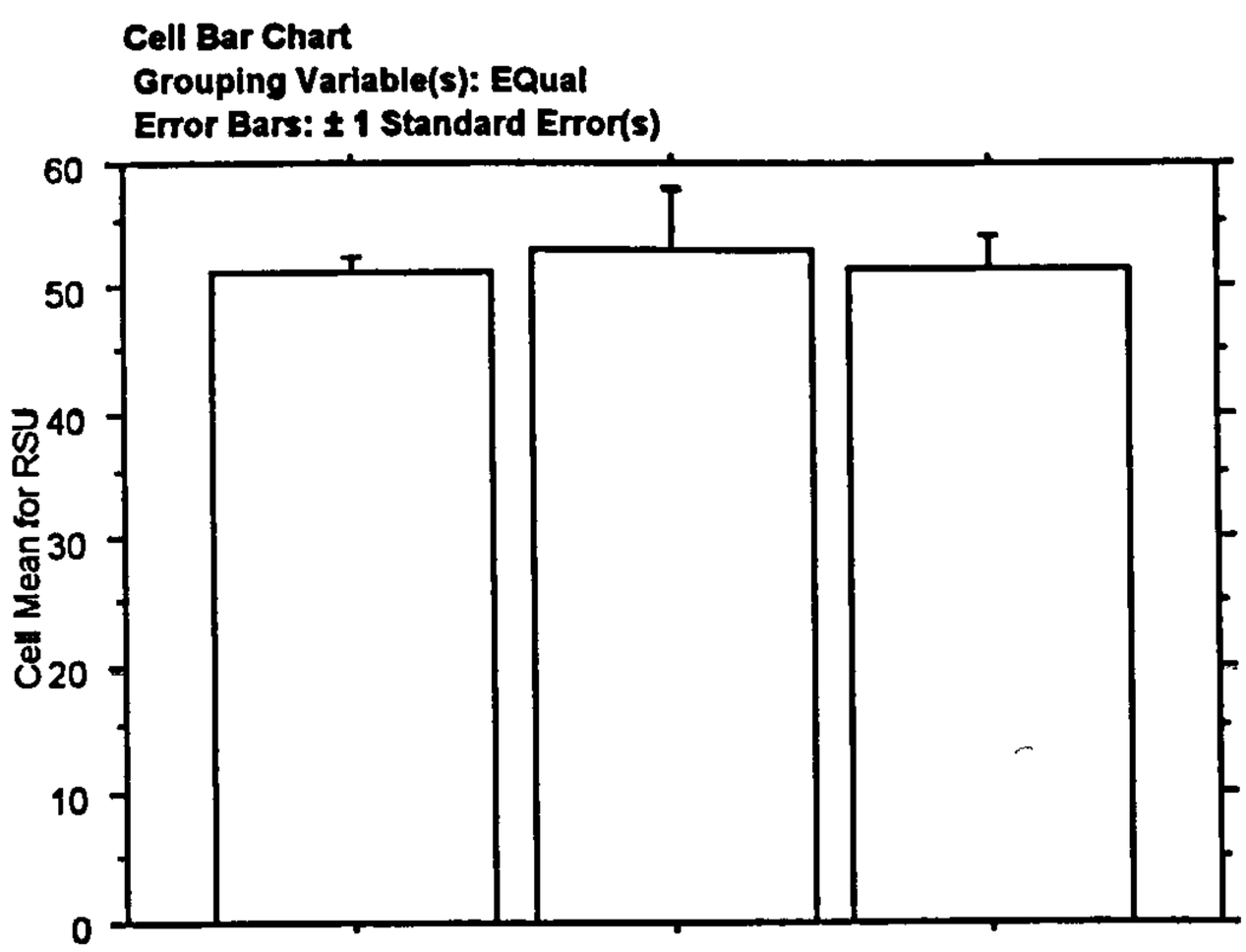


Fig. 7.4.6 Cell Plot: Raw Score Untimed and Group Entry Qualifications.
1 = 5 O Levels
2 = O Levels & A Levels
3 = Informal Qualifications (DC Test, Access course, BTEC

Age, however, was subjected to correlational analysis to examine the test author's claims of an expected increase of score with advancing age. The relationship between untimed scores (RSU) and age were thus examined.

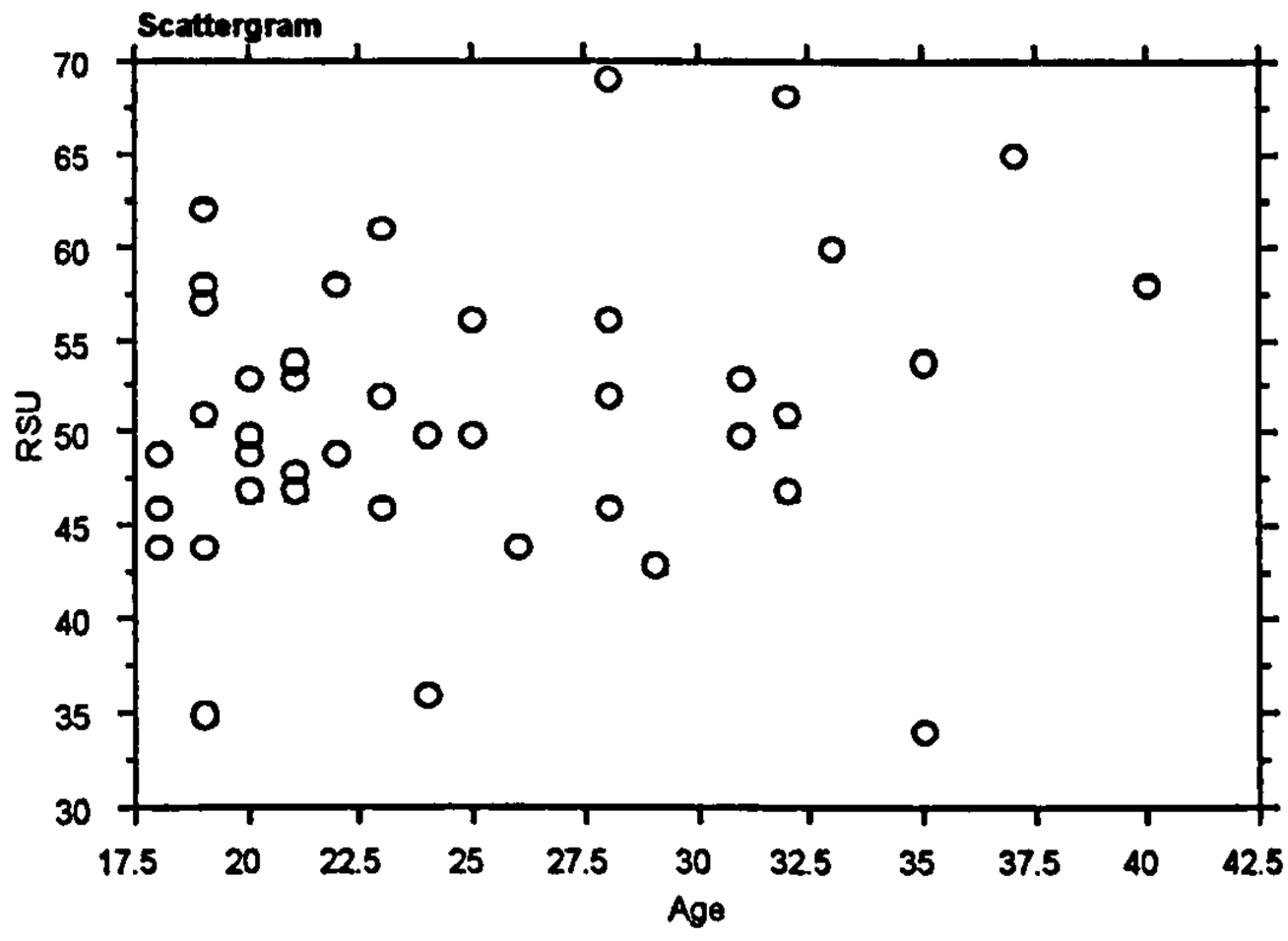


Fig. 7.4.7 Bivariate Plot: RSU & Age.

Table 7.4.1 Correlation Matrix: Raw Score Untimed (RSU) and Age.

Correlation Matrix

	RSU	Age
RSU	1.000	.221
Age	.221	1.000

43 observations were used in this computation.

Table 7.4.1 demonstrates a positive but very weak correlation between Age and RSU. Although this relationship does not achieve significance it does lend weak support to the author's general claim of an expected increase in score with increasing age.

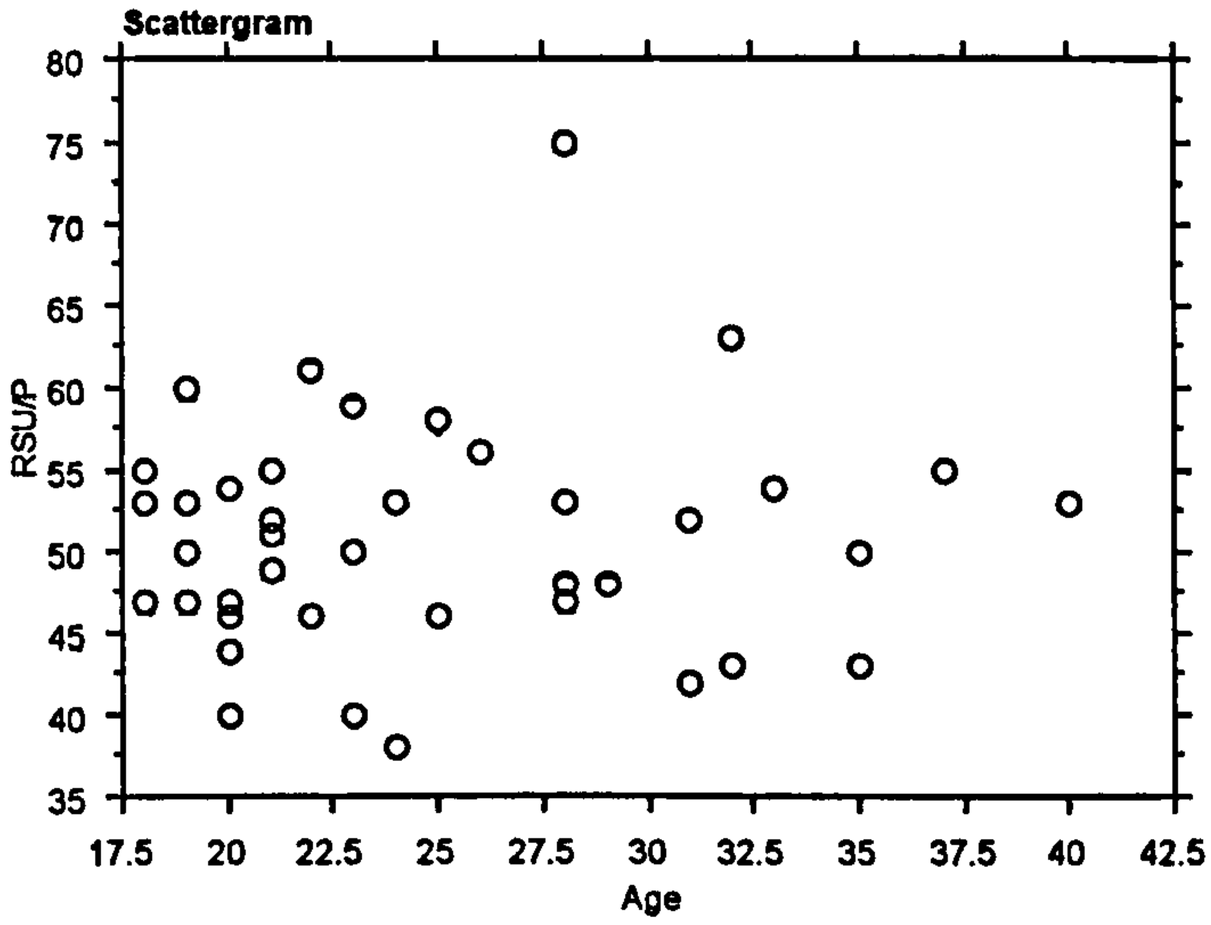


Fig. 7.4.8 Bivariate Plot: Raw Score Untimed Post Test RSU/P, phase 4) and Age.

Table 7.4.2 Correlation Matrix Raw Score Untimed Post Test (RSU/P) and Age.

Correlation Matrix

	Age	RSU/P
Age	1.000	.046
RSU/P	.046	1.000

43 observations were used in this computation.

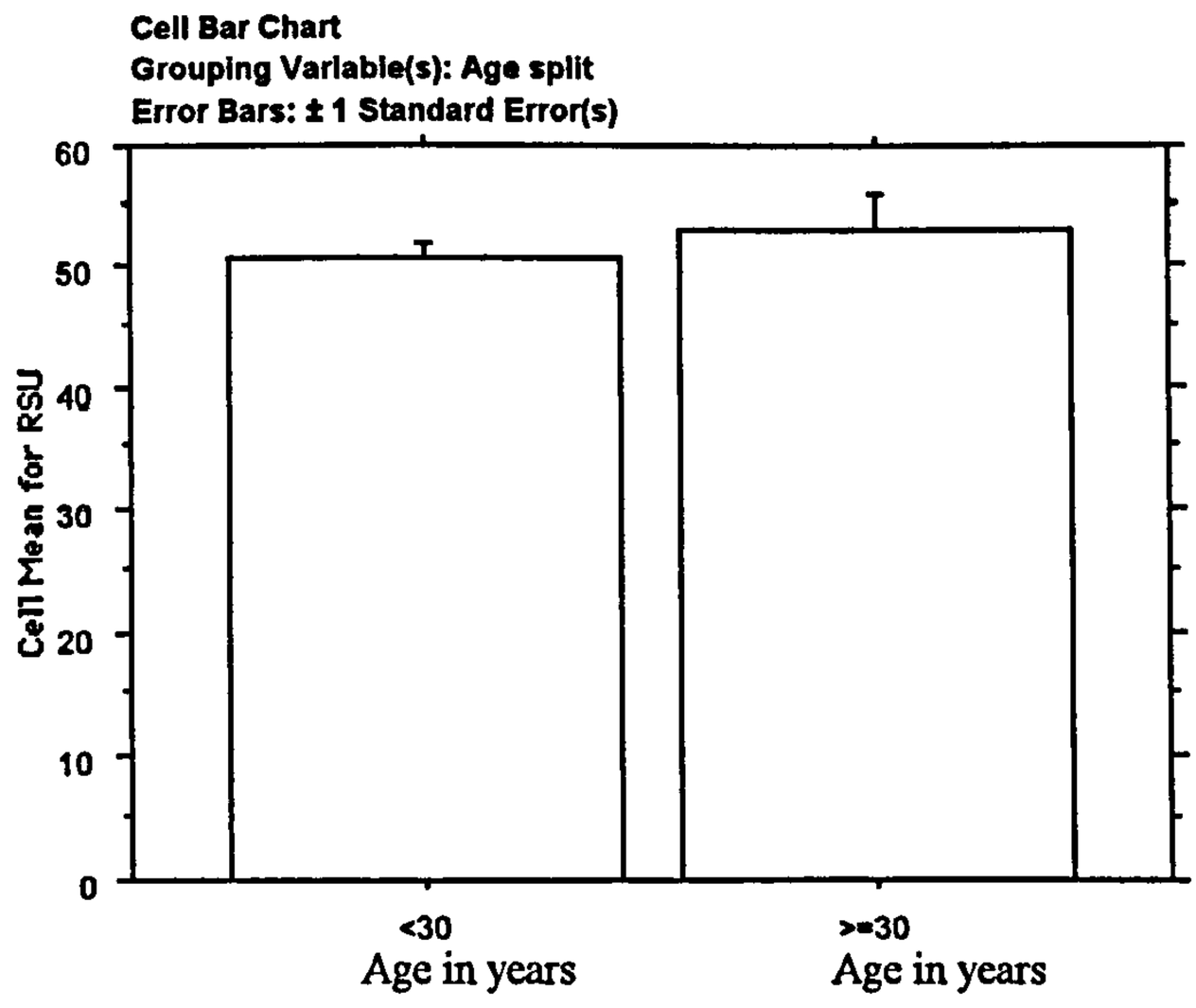


Fig. 7.4.9 Cell Bar Chart Raw Score Untimed & Age Group.

Unpaired t-test for RSU
Grouping Variable: Age split
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
<30, >=30	-2.219	41	-.819	.4175

Group Info for RSU
Grouping Variable: Age split

	Count	Mean	Variance	Std. Dev.	Std. Err
<30	32	50.781	48.693	6.978	1.234
>=30	11	53.000	95.400	9.767	2.945

Fig. 7.4.10 Unpaired t-test Raw Score Untimed and <30yrs and >30yrs Age.

The above tables and figures representing phase 4 the WGCTA post tests further demonstrate non significant relationships between age and test scores.

7.5 Concurrent Think Aloud and Retrospective Qualitative Data Analysis

Phases 2 & 3

Initially the results for the twelve case studies arising from phases 2 and 3 will be presented in tabulated case format in conjunction with focal universe and think aloud characteristics. Secondly, a tabulated composite of all participant results from all four phases will be presented. Finally, the results and important observations arising from the data will be summarised.

Case 1 (Participant 52)

Table 7.5.1. Case 1: Focal Universe and Think Aloud Characteristics

Phase 2: (Participant 52)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
26	2	8	18

Table 7.5.2. Case 1: Categorisation of Argument Complexity (Participant 52, Phase 2)

Data Category	**Argument complexity**
Post simulation judgement	Absolutist epistemology (1)
Test for Adequacy	Absolutist epistemology (1)
Post judgement stimulated recall, Q1	Absolutist epistemology (1)
Q2	Absolutist epistemology (1)
Q3	Absolutist epistemology (1)
Q4	Absolutist epistemology (1)
Q5	Potential multiplist epistemology (2)
Q6	Absolutist epistemology (1)
Q7	Multiplist epistemology (3)
Q8	Absolutist epistemology (1)

Case Summary - Phase 2:

This subject constructed a relatively small focal universe and the protocol was characterised by many pauses resulting in 2 researcher prompts. One rewind was undertaken by this participant to recapitulate previous information. Active information processing instances exceeded information reception instances. Of the 10 simulation derived questions eight of the subject responses were categorised as being of an absolutist epistemology and were, thus, judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate one example of a potential multiplist epistemology and one example of a multiplist epistemology. In response to the test for adequacy the participant responded no, and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence but with some examples of pseudo, covariation and counterfactual evidence.

Naturalistic Reasoning Mode = Absolutist epistemology. (8)

Table 7.5.3 Case 1: Focal Universe and Think Aloud Characteristics.

Phase 3: (Participant 52)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
31	1	11	20

Table 7.5.4 Categorisation of Argument Complexity (Participant 52, Phase 3)

Data category	**Argument complexity**
Post simulation judgement	Absolutist epistemology (1)
Test for adequacy	Multiplist epistemology (3)
Post judgement stimulated recall Q1	Absolutist epistemology (1)
Q2	Absolutist epistemology (1)
Q3	Absolutist epistemology (1)
Q4	Potential multiplist epistemology (2)

Data category	Argument complexity
Q5	Absolutist epistemology (1)
Q6	Absolutist epistemology (1)
Q7	Absolutist epistemology (1)
Q8	Absolutist epistemology (1)
Q9	Absolutist epistemology (1)
Q10	Absolutist epistemology (1)
Q11	Absolutist epistemology (1)
Q12	Absolutist epistemology (1)

Case Summary - Phase 3:

This participant constructed a larger focal universe for this phase than in phase 2 and there was only one researcher prompt required. Active information processing instances exceeded information reception instances. Of the 14 simulation derived questions 12 of the Participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate one example of a potential multiplist epistemology and one example of a multiplist epistemology. In response to the test for adequacy the participant responded no and supported this by multiplist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence but with some examples of pseudo and covariation evidence.

Naturalistic Reasoning Mode = Absolutist epistemology (12)

Case 2 (Participant 7)

Table 7.5.5 Focal Universe and Think Aloud Characteristics.

Phase 2: (Participant 7)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
44	0	7	37

Table 7.5.6 Categorisation of Argument Complexity (Participant 7, Phase 2)

Data category		**Argument complexity**	
Post simulation judgement		Absolutist epistemology	(1)
Test for adequacy		Absolutist epistemology	(1)
Post judgement stimulated recall	Q1	Absolutist epistemology	(1)
	Q2	Absolutist epistemology	(1)
	Q3	Multiplist epistemology	(3)
	Q4	Absolutist epistemology	(1)
	Q5	Absolutist epistemology	(1)
	Q6	Absolutist epistemology	(1)
	Q7	Absolutist epistemology	(1)
	Q8	Multiplist epistemology	(3)

Case Summary - Phase 2:

This Participant constructed a focal universe of 44 elements for this phase. Active information processing instances exceeded information reception instances. Of the 10 simulation derived questions eight of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate two examples of a multiplist epistemology. In response to the test for adequacy the participant responded no, and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence but with some examples of pseudo, covariation and counterfactual evidence.

Naturalistic Reasoning Mode = Absolutist epistemology (8)

Table 7.5.7 Focal Universe and Think Aloud Characteristics

Phase 3: (Participant 7)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
67	0	14	53

Table 7.5.8 Categorisation of Argument complexity (Participant 7, Phase 3)

Data category		**Argument complexity**	
Post simulation judgement		Absolutist epistemology	(1)
Test for adequacy		Absolutist epistemology	(1)
Post judgement stimulated recall	Q1	Absolutist epistemology	(2)
	Q2	Potential multiplist epistemology	(2)
	Q3	Absolutist epistemology	(1)
	Q4	Absolutist epistemology	(1)
	Q5	Absolutist epistemology	(1)

Data category	Argument complexity
Q6	Multiplist epistemology (3)
Q7	Absolutist epistemology (1)
Q8	Absolutist epistemology (1)
Q9	Potential multiplist epistemology (2)
Q10	Multiplist epistemology (3)
Q11	Absolutist epistemology (1)
Q12	Absolutist epistemology (1)
Q13	Absolutist epistemology (1)
Q14	Absolutist epistemology (1)
Q15	Multiplist epistemology (3)
Q16	Multiplist epistemology (3)

Case Summary - Phase 3:

This participant constructed a larger focal universe of 67 elements for this phase than in phase two. Active information processing instances exceeded information reception instances. Of the 18 simulation derived questions 12 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate two examples of a potential multiplist epistemology and four examples of a multiplist epistemology. In response to the test for adequacy the participant responded no and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence but with some examples of pseudo, covariation and counterfactual evidence.

Naturalistic Reasoning Mode = Absolutist epistemology (12)

Case 3 (Participant 4)

Table 7.5.9 Focal Universe and Think Aloud Characteristics

Phase 2: (Participant 4)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
56	2	18	38

Table 7.5.10 Categorisation of Argument Complexity (Participant 4, Phase 2)

Data category	**Argument complexity**
Post simulation judgement	Absolutist epistemology (1)
Test for adequacy	Absolutist epistemology (1)
Post judgement stimulated recall Q1	Absolutist epistemology (1)
Q2	Absolutist epistemology (1)
Q3	Absolutist epistemology (1)
Q4	Potential multiplist epistemology (2)
Q5	Absolutist epistemology (1)
Q6	Absolutist epistemology (1)
Q7	Absolutist epistemology (1)
Q8	Absolutist epistemology (1)
Q9	Absolutist epistemology (1)

Case Summary - Phase 2:

This participant constructed a focal universe of 56 elements for this phase and two researcher prompts were required. Active information processing instances exceeded information reception instances. Of the 11 simulation derived questions 10 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate one example of a potential multiplist epistemology. In response to the test for adequacy the participant responded yes and supported this by absolutist

epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence but with many examples of pseudoevidence.

Naturalistic Reasoning Mode = Absolutist epistemology (10)

Table 7.5.11 Focal Universe and Think Aloud Characteristics

Phase 3: (Participant 4)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
61	0	20	41

Table 7.5.12 Categorisation of Argument Complexity (Participant 4, Phase 3)

Data category		**Argument complexity**
Post simulation judgement		Absolutist epistemology (1)
Test for adequacy		Absolutist epistemology (1)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Absolutist epistemology (1)
	Q3	Absolutist epistemology (1)
	Q4	Absolutist epistemology (1)
	Q5	Absolutist epistemology (1)
	Q6	Absolutist epistemology (1)
	Q7	Absolutist epistemology (1)
	Q8	Absolutist epistemology (1)
	Q9	Absolutist epistemology (1)
	Q10	Absolutist epistemology (1)
	Q11	Potential multiplist epistemology (2)
	Q12	Absolutist epistemology (1)
	Q13	Absolutist epistemology (1)
	Q14	Potential multiplist epistemology (2)
	Q15	Absolutist epistemology (1)

Data Category	Argument Complexity
Q16	Absolutist epistemology (1)
Q17	Absolutist epistemology (1)

Case Summary - Phase 3:

This participant constructed a slightly larger focal universe of 61 elements for this phase than in phase two and no researcher prompts were required. Active information processing instances exceeded information reception instances. Of the 19 simulation derived questions 17 of the participant responses were categorised as being of an absolutist epistemology and were, thus, judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate two examples of a potential multiplist epistemology. In response to the test for adequacy the participant's response was equivocal and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence but with many examples of pseudoevidence.

Naturalistic Reasoning Mode = Absolutist epistemology (17)

Case 4 (Participant 45)

Table 7.5.13 Focal Universe and Think Aloud Characteristics

Phase 2: (Participant 45)

Focal Universe	Researcher Prompts	Information Reception	Information Processing
65	0	15	50

Table 7.5.14 Categorisation of Argument Complexity (Participant 45, Phase 2)

Data category	**Argument complexity**
Post simulation judgement	Potential multiplist epistemology (2)
Test for adequacy	Potential multiplist epistemology (2)
Post judgement stimulated recall Q1	Potential multiplist epistemology (2)
Q2	Absolutist epistemology (1)
Q3	Absolutist epistemology (1)
Q4	Absolutist epistemology (1)
Q5	Absolutist epistemology (1)
Q6	Absolutist epistemology (1)
Q7	Absolutist epistemology (1)
Q8	Absolutist epistemology (1)
Q9	Potential multiplist epistemology (2)
Q10	Absolutist epistemology (1)
Q11	Potential multiplist epistemology (2)
Q12	Multiplist epistemology (3)
Q13	Absolutist epistemology (1)

Case Summary - Phase 2:

This participant constructed an initial focal universe of 65 elements for this phase and no researcher prompts were required. Active information processing instances exceeded information reception instances. Of the 15 simulation derived questions nine of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate five examples of a potential multiplist epistemology and one example of a multiplist epistemology. In response to the test for adequacy the participant's response was equivocal and supported this by potential multiplist epistemological reasoning. The nature of reasoning was comprised predominantly of

pseudoevidence but with many examples of correspondence evidence and several examples of non-evidence.

Naturalistic Reasoning Mode = Absolutist epistemology (9)

Table 7.5.15 Focal Universe and Think Aloud Characteristics

Phase 3: (Participant 45)

Focal Universe	Researcher Prompts	Information Reception	Information Processing
85	0	49	36

Table 7.5.16 Categorisation of Argument Complexity (Participant 45, Phase 3)

Data category		Argument complexity	
Post simulation judgement		Absolutist epistemology	(1)
Test for adequacy		Absolutist epistemology	(1)
Post judgement stimulated recall	Q1	Absolutist epistemology	(1)
	Q2	Absolutist epistemology	(1)
	Q3	Absolutist epistemology	(1)
	Q4	Absolutist epistemology	(1)
	Q5	Absolutist epistemology	(1)
	Q6	Absolutist epistemology	(1)
	Q7	Potential multiplist epistemology	(2)
	Q8	Absolutist epistemology	(1)
	Q9	Absolutist epistemology	(1)
	Q10	Multiplist epistemology	(3)
	Q11	Absolutist epistemology	(1)
	Q12	Absolutist epistemology	(1)
	Q13	Potential multiplist epistemology	(2)
	Q14	Multiplist epistemology	(3)
	Q15	Absolutist epistemology	(1)

Case Summary - Phase 3:

This participant constructed a larger focal universe of 85 elements for this phase than in phase two and no researcher prompts were required. Information reception instances exceeded active information processing instances. Of the 17 simulation derived questions 13 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate two examples of a potential multiplist epistemology and two examples of a multiplist epistemology. In response to the test for adequacy the participant's response was no and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence but with many examples of pseudoevidence and several examples of non-evidence. One example of covariation evidence was demonstrated.

Naturalistic Reasoning Mode = Absolutist epistemology (13)

Case 5 (Participant 33)

Table 7.5.17 Focal Universe and Think Aloud Characteristics

Phase 2: (Participant 33)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
41	2	15	26

Table 7.5.18 Categorisation of Argument Complexity (Participant 33, Phase 2)

Data category		**Argument complexity**
Post simulation judgement		Absolutist epistemology (1)
Test for adequacy		Absolutist epistemology (1)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Absolutist epistemology (1)

Data Category	Argument Complexity
Q3	Absolutist epistemology (1)
Q4	Absolutist epistemology (1)
Q5	Absolutist epistemology (1)
Q6	Multiplist epistemology (3)
Q7	Absolutist epistemology (1)
Q8	Absolutist epistemology (1)
Q9	Potential multiplist epistemology (2)
Q10	Absolutist epistemology (1)
Q11	Potential multiplist epistemology (2)
Q12	Absolutist epistemology (1)

Case Summary - Phase 2:

This participant constructed an initial focal universe of 41 elements for this phase and two researcher prompts were required. Active information processing instances exceeded information reception instances (26/15). Of the 14 simulation derived questions 11 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate two examples of a potential multiplist epistemology and one example of a multiplist epistemology. In response to the test for adequacy the participant's response was equivocal and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also examples of pseudoevidence and one example each of covariation evidence and correlated change evidence. This participant also demonstrated an instance of reasoning where the response to a think aloud generated question was based upon evidence that would not have been functionally available at the time that the utterance was generated. The evidence related to the playing of chess came later in the simulation than the initial utterance relating to an active mind. It would appear, here that the participant searched memory stores for evidence that would best address the question, as opposed to recalling the actual processes that underpinned the initial utterance.

Naturalistic Reasoning Mode = Absolutist epistemology (11)

Table 7.5.19 Focal Universe and Think Aloud Characteristics

Phase 3: (Participant 33)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
32	0 (long pauses<30s)	7	25

Table 7.5.20 Categorisation of Argument Complexity (Participant 33, Phase 3)

Data Category		**Argument Complexity**
Post simulation judgement		Multiplist epistemology (3)
Test for adequacy		Multiplist epistemology (3)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Absolutist epistemology (1)
	Q3	Multiplist epistemology (3)
	Q4	Absolutist epistemology (1)
	Q5	Absolutist epistemology (1)
	Q6	Absolutist epistemology (1)
	Q7	Multiplist epistemology (3)
	Q8	Absolutist epistemology (1)
	Q9	Absolutist epistemology (1)
	Q10	Absolutist epistemology (1)
	Q11	Absolutist epistemology (1)
	Q12	Absolutist epistemology (1)
	Q13	Absolutist epistemology (1)
	Q14	Absolutist epistemology (1)
	Q15	Multiplist epistemology (3)
	Q16	Potential multiplist epistemology (2)
	Q17	Multiplist epistemology (3)
	Q18	Absolutist epistemology (1)
	Q19	Absolutist epistemology (1)

Case Summary - Phase 3:

This participant constructed a smaller focal universe of 32 elements for this phase than in phase two. No researcher prompts were required although there were many long pauses which did not exceed the 30 second threshold for prompting. Active

information processing instances exceeded information reception instances (25/7). Of the 21 simulation derived questions 14 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate one example of a potential multiplist epistemology and six examples of multiplist epistemology. In response to the test for adequacy the participant's response was no and supported this by multiplist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also examples of pseudoevidence, covariation evidence and one example each of counterfactual and correlated change evidence.

Naturalistic Reasoning Mode = Absolutist epistemology (14)

Case 6 (Participant 53)

Table 7.5.21 Focal Universe and Think Aloud Characteristics.

Phase 2: (Participant 53)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
44	1	2	42

Table 7.5.22: Argument Complexity Categorisation (Participant 53, phase 2)

Data category		**Argument complexity**
Post simulation judgement		Absolutist epistemology (1)
Test for adequacy		Absolutist epistemology (1)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Absolutist epistemology (1)
	Q3	Multiplist epistemology (3)
	Q4	Potential multiplist epistemology (2)
	Q5	Absolutist epistemology (1)
	Q6	Absolutist epistemology (1)
	Q7	Absolutist epistemology (1)
	Q8	Absolutist epistemology (1)

Case Summary - Phase 2:

This participant constructed an initial focal universe of 44 elements for this phase. One researcher prompt was required. Active information processing instances exceeded information reception instances (42/2). Of the 10 simulation derived questions eight of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate one example of a potential multiplist epistemology and one example of multiplist epistemology. In response to the test for adequacy the participant's response was no and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also multiple examples of pseudoevidence.

Naturalistic Reasoning Mode = Absolutist epistemology (8)

Phase 3: (Participant 53)

Table 7.5.23 Focal Universe and Think Aloud Characteristics.

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
35	0	0	35

Table 7.5.24: Categorisation of Argument Complexity (Participant 53, Phase 3)

Data category		**Argument complexity**
Post simulation judgement		Potential multiplist epistemology (2)
Test for adequacy		Absolutist epistemology (1)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Absolutist epistemology (1)
	Q3	Potential multiplist epistemology (2)
	Q4	Absolutist epistemology (1)
	Q5	Absolutist epistemology (1)
	Q6	Absolutist epistemology (1)
	Q7	Absolutist epistemology (1)
	Q8	Absolutist epistemology (1)
	Q9	Potential multiplist epistemology (2)
	Q10	Absolutist epistemology (1)
	Q11	Absolutist epistemology (1)
	Q12	Multiplist epistemology (3)

Case Summary - Phase 3:

This participant constructed a smaller focal universe of 35 elements for this phase than in phase two. No researcher prompts were required. Only active information processing instances were demonstrated during this think aloud phase (35/0). Of the 14 simulation derived questions 10 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the

Naturalistic Reasoning Mode. The participant did demonstrate three examples of a potential multiplist epistemology and one example of multiplist epistemology. In response to the test for adequacy the participant's response was no and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence with numerous examples of pseudoevidence.

Naturalistic reasoning tendency = Absolutist epistemology (10)

Case 7 (Participant 30)

Table 7.5.25 Focal Universe and Think Aloud Characteristics

Phase 2: (Participant 30)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
85	0	38	47

Table 7.5.26 Categorisation of Argument complexity (Participant 30, Phase 2)

Data category		**Argument complexity**	
Post simulation judgement		Absolutist epistemology	(1)
Test for adequacy		Absolutist epistemology	(1)
Post judgement stimulated recall	Q1	Absolutist epistemology	(1)
	Q2	Absolutist epistemology	(1)
	Q3	Absolutist epistemology	(1)
	Q4	Absolutist epistemology	(1)
	Q5	Potential multiplist epistemology	(2)
	Q6	Absolutist epistemology	(1)
	Q7	Multiplist epistemology	(3)
	Q8	Absolutist epistemology	(1)

Case Summary - Phase 2:

This participant constructed an initial focal universe of 85 elements for this phase and no researcher prompts were required. Active information processing instances exceeded information reception instances (47/38). Of the 10 simulation derived questions nine of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate one example of multiplist epistemology. In response to the test for adequacy the participant's response was no and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also examples of pseudoevidence, two instances of covariation evidence and one example of correlated change evidence.

Naturalistic Reasoning Mode = Absolutist epistemology (9)

Phase 3: (Participant 30)

Table 7.5.27: Focal Universe and Think Aloud Characteristics.

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
91	0	34	57

Table 7.5.28: Categorisation of Argument Complexity (Participant 30, Phase 3)

Data category		**Argument complexity**
Post simulation judgement		Potential Multiplist epistemology (2)
Test for adequacy		Absolutist epistemology (1)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Potential multiplist epistemology (2)
	Q3	Absolutist epistemology (1)
	Q4	Absolutist epistemology (1)
	Q5	Potential multiplist epistemology (2)
	Q6	Potential multiplist epistemology (2)
	Q7	Multiplist epistemology (3)
	Q8	Absolutist epistemology (1)
	Q9	Absolutist epistemology (1)
	Q10	Absolutist epistemology (1)
	Q11	Potential multiplist epistemology (2)
	Q12	Potential multiplist epistemology (2)
	Q13	Potential Multiplist epistemology (2)

Case Summary - Phase 3 :

This participant constructed a larger focal universe of 91 elements for this phase than in phase two. No researcher prompts were required. Active information processing instances exceeded information reception instances (57/34). Of the 15 simulation derived questions seven of the participant responses were categorised as being of an absolutist epistemology. The participant did, however, demonstrate seven examples of a potential multiplist epistemology and one example of a multiplist epistemology. The Naturalistic Reasoning Mode was, thus, judged to be of a potential multiplist epistemology. In response to the test for adequacy the participant's response was yes and supported this by multiplist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also multiple examples of pseudoevidence, two of covariation evidence, one example of non-evidence and one example of counterfactual evidence.

This participant also demonstrated several instances of metacognitive reasoning where the nature or fairness of the reasoning was verbalised.

Naturalistic Reasoning Mode = Potential Multiplist Epistemology (7)

Case 8 (Participant 10)

Table 7.5.29: Focal Universe and Think Aloud Characteristics.

Phase 2: (Participant 10)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
49	0	14	35

Table 7.5.30: Categorisation of Argument Complexity (Participant 10, Phase 2)

Data category		**Argument complexity**	
Post simulation judgement		Absolutist epistemology	(1)
Test for adequacy		Absolutist epistemology	(1)
Post judgement stimulated recall	Q1	Potential multiplist epistemology	(2)
	Q2	Absolutist epistemology	(1)
	Q3	Absolutist epistemology	(1)
	Q4	Absolutist epistemology	(1)
	Q5	Absolutist epistemology	(1)
	Q6	Absolutist epistemology	(1)
	Q7	Absolutist epistemology	(1)
	Q8	Absolutist epistemology	(1)
	Q9	Multiplist epistemology	(3)

Case Summary - Phase 2:

This participant constructed an initial focal universe of 49 elements for this phase. No researcher prompts were required. Active information processing instances exceeded information reception instances (35/14). Of the 11 simulation derived questions nine of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate one example of a potential multiplist epistemology and one example of multiplist epistemology. In response to the test for adequacy the participant's response was no and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence with multiple examples of pseudoevidence and two examples of covariation evidence.

Naturalistic Reasoning Mode = Absolutist epistemology (9)

Phase 3: (Participant 10)

Table 7.5.31 Focal Universe and Think Aloud Characteristics.

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
51	0	19	31 + 1 NFU

Table 7.5.32 Categorisation of Argument Complexity (Participant 10, phase 3)

Data category		**Argument complexity**
Post simulation judgement		Absolutist epistemology (1)
Test for adequacy		Absolutist epistemology (1)
Post judgement stimulated recall	Q1	Multiplist epistemology (3)
	Q2	Absolutist epistemology (1)
	Q3	Absolutist epistemology (1)
	Q4	Absolutist epistemology (1)
	Q5	Absolutist epistemology (1)
	Q6	Absolutist epistemology (1)
	Q7	Absolutist epistemology (1)
	Q8	Absolutist epistemology (1)
	Q9	Absolutist epistemology (1)
	Q10	Absolutist epistemology (1)
	Q11	Absolutist epistemology (1)
	Q12	Absolutist epistemology (1)
	Q13	Absolutist epistemology (1)
	Q14	Absolutist epistemology (1)

Case Summary - Phase 3:

This participant constructed a slightly larger focal universe of 51 elements for this phase when compared to phase two. No researcher prompts were required. Active information processing instances exceeded information reception instances

(31+1NFU/19). Of the 16 simulation derived questions 15 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate one example of multiplist epistemology. In response to the test for adequacy the participant's response was yes and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also multiple examples of pseudoevidence.

Naturalistic Reasoning Mode = Absolutist epistemology(15).

Case 9 (Participant 8)

Table 7.5.33 Focal Universe and Think Aloud Characteristics.

Phase 2: (Participant 8)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
62	0	27	35

Table 7..5.34 Categorisation of Argument Complexity (Participant 8, phase 2)

Data category		**Argument complexity**	
Post simulation judgement		Absolutist epistemology	(1)
Test for adequacy		Potential multiplist epistemology	(2)
Post judgement stimulated recall	Q1	Absolutist epistemology	(1)
	Q2	Absolutist epistemology	(1)
	Q3	Potential multiplist epistemology	(2)
	Q4	Absolutist epistemology	(1)
	Q5	Multiplist epistemology	(3)
	Q6	Absolutist epistemology	(1)
	Q7	Absolutist epistemology	(1)

Case Summary - Phase 2:

This participant constructed an initial focal universe of 62 elements for this phase. No researcher prompts were required. Active information processing instances exceeded information reception instances (35/27). Of the nine simulation derived questions six of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate two examples of a potential multiplist epistemology and one example of multiplist epistemology. In response to the test for adequacy the participant's response was no and supported this by potential multiplist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also examples of pseudoevidence and one example of non-evidence. Some utterances in the post simulation judgement were not manifested in the simulation mediated attentive focal universe, silent processing must, therefore, have taken place.

Naturalistic Reasoning Mode = Absolutist epistemology (6)

Phase 3: (Participant 8)

Table 7.5.35 Focal Universe and Think Aloud Characteristics.

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
70	0	44	26

Table 7.5.36 Categorisation of Argument Complexity (Participant 8, phase 3)

Data category		**Argument complexity**	
Post simulation judgement		Potential multiplist epistemology	(2)
Test for adequacy		Absolutist epistemology	(1)
Post judgement stimulated recall	Q1	Absolutist epistemology	(1)
	Q2	Absolutist epistemology	(1)
	Q3	Potential multiplist epistemology	(2)
	Q4	Potential multiplist epistemology	(2)
	Q5	Absolutist epistemology	(1)
	Q6	Absolutist epistemology	(1)
	Q7	Absolutist epistemology	(1)
	Q8	Multiplist epistemology	(3)
	Q9	Absolutist epistemology	(1)
	Q10	Absolutist epistemology	(1)
	Q11	Absolutist epistemology	(1)
	Q12	Multiplist epistemology	(3)
	Q13	Multiplist epistemology	(3)

Case Summary - Phase 3:

This participant constructed a slightly larger focal universe of 62 elements for this phase when compared with phase two. No researcher prompts were required. Information reception instances exceeded active information processing instances

(44/26). Of the 15 simulation derived questions nine of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. The participant did demonstrate three examples of a potential multiplist epistemology and three examples of multiplist epistemology. In response to the test for adequacy the participant's response was no and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also multiple examples of pseudoevidence, three examples of covariation evidence and one example of counterfactual evidence.

Naturalistic Reasoning Mode = Absolutist epistemology (9)

Case 10 (Participant 38

Phase 2:

Table 7.5.37 Focal Universe and Think Aloud Characteristics (Participant 38)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
34	0	0	34

Table 7.5.38 Categorisation of Argument Complexity (Participant 38, phase 2)

Data category		**Argument complexity**
Post simulation judgement		Absolutist epistemology (1)
Test for adequacy		Absolutist epistemology (1)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Absolutist epistemology (1)
	Q3	Absolutist epistemology (1)
	Q4	Absolutist epistemology (1)
	Q5	Absolutist epistemology (1)
	Q6	Absolutist epistemology (1)
	Q7	Absolutist epistemology (1)
	Q8	Absolutist epistemology (1)
	Q9	Absolutist epistemology (1)
	Q10	Absolutist epistemology (1)
	Q11	Absolutist epistemology (1)
	Q12	Absolutist epistemology (1)

Case Summary - Phase 2:

This participant constructed an initial focal universe of 34 elements for this phase. No researcher prompts were required but the protocol consisted of many long pauses not reaching the 30 second prompting threshold. Information processing instances were the only form of reasoning demonstrated in this protocol (34/0). Of the 14 simulation derived questions all 14 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. In response to the test for adequacy the participant's response was no and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also multiple

examples of pseudoevidence. Much of this Participant's reasoning performance is characterised by early closure strategies.

Naturalistic reasoning mode = Absolutist epistemology (14)

Phase 3:

Table 7.5.39 Focal Universe characteristics (Participant 38, phase 3)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
35	0	3	32

Table 7.5.40 Argument Complexity Categorisation (Participant 38, phase 3)

Data category		**Argument complexity**
Post simulation judgement		Absolutist epistemology (1)
Test for adequacy		Absolutist epistemology (1)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Absolutist epistemology (1)
	Q3	Absolutist epistemology (1)
	Q4	Absolutist epistemology (1)
	Q5	Absolutist epistemology (1)
	Q6	Absolutist epistemology (1)
	Q7	Absolutist epistemology (1)
	Q8	Absolutist epistemology (1)
	Q9	Absolutist epistemology (1)
	Q10	Absolutist epistemology (1)
	Q11	Absolutist epistemology (1)
	Q12	Absolutist epistemology (1)
	Q13	Absolutist epistemology (1)
	Q14	Absolutist epistemology (1)
	Q15	Absolutist epistemology (1)
	Q16	Absolutist epistemology (1)
	Q17	Absolutist epistemology (1)
	Q18	Absolutist epistemology (1)

Case Summary - Phase 3:

This participant constructed a focal universe of 35 elements for this phase which was 1 element larger than in phase two. No researcher prompts were required but the protocol consisted of many long pauses not reaching the 30 second prompting threshold. Information processing instances exceeded information reception instances (32/3). Of the 20 simulation derived questions all 20 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. In response to the test for adequacy the participant's response was no and supported this by absolutist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also multiple examples of pseudoevidence. Again, this participant demonstrates consistent early closure reasoning. Evidence of my-side arguments consistently supported across differing stimulated recall events and across phases. Participant demonstrates several instances of reasoning where the information used to support think aloud utterances were not functionally available (NFA).

Naturalistic reasoning mode = Absolutist epistemology (20)

Case 11 (Participant 37)

Phase 2:

Table 7.5.41 Focal Universe and Think Aloud characteristics (Participant 37)

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
74	0	25	49

Table 7.5.42 Categorisation of Argument Complexity (Participant 37, phase 2)

Data category		**Argument complexity**
Post simulation judgement		Potential multiplist epistemology (2)
Test for adequacy		Multiplist epistemology (3)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Absolutist epistemology (1)
	Q3	Absolutist epistemology (1)
	Q4	Absolutist epistemology (1)
	Q5	Potential multiplist epistemology (2)
	Q6	Absolutist epistemology (1)
	Q7	Absolutist epistemology (1)

Case Summary - Phase 2:

This participant constructed a focal universe of 74 elements for this phase. No researcher prompts were required. Information processing instances exceeded information reception instances (49/25). Of the nine simulation derived questions six of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. There were also two examples of potential epistemological and one example of multiplist epistemological reasoning. In response to the test for adequacy the participant's response was yes and supported this by multiplist epistemological reasoning. The

nature of reasoning was comprised predominantly of correspondence evidence. There were also multiple examples of pseudoevidence plus one example of counterfactual and one example of covariation evidence.

Naturalistic reasoning mode = Absolutist epistemology (6)

Phase 3: (Participant 37)

Table 7.5.43 Focal Universe and Think Aloud Characteristics

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
58	0	19	39

Table 7.5.44 Categorisation of Argument Complexity (Participant 37, phase 3)

Data category	**Argument complexity**
Post simulation judgement	Potential multiplist epistemology (2)
Test for adequacy	Multiplist epistemology (3)
Post judgement stimulated recall Q1	Absolutist epistemology (1)
Q2	Absolutist epistemology (1)
Q3	Potential multiplist epistemology (2)
Q4	Absolutist epistemology (1)
Q5	Absolutist epistemology (1)
Q6	Absolutist epistemology (1)
Q7	Multiplist epistemology (3)
Q8	Potential multiplist epistemology (2)
Q9	Absolutist epistemology (1)
Q10	Absolutist epistemology (1)
Q11	Absolutist epistemology (1)
Q12	Absolutist epistemology (1)
Q13	Absolutist epistemology (1)
Q14	Potential multiplist epistemology (2)
Q15	Absolutist epistemology (1)

Case Summary - Phase 3:

This participant constructed a smaller focal universe of 58 elements for this phase than compared with phase two. No researcher prompts were required. Information processing instances exceeded information reception instances (39/19). Of the 17 simulation derived questions 11 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. There were also four examples of potential multiplist epistemological and two examples of multiplist epistemological reasoning. In

response to the Test for Adequacy the participant's response was equivocal, and supported this by multiplist epistemological reasoning. The nature of reasoning was comprised predominantly of correspondence evidence. There were also multiple examples of pseudoevidence plus four examples of counterfactual evidence and one example of metacognition.

Naturalistic reasoning mode = Absolutist epistemology (11)

Case 12 (Participant 2)

Phase 2:

Table 7.5.45 Focal Universe and Think Aloud Characteristics:

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
72	0	37	35

Table 7.5.46 Categorisation of Argument complexity (Participant 2, phase 2)

Data category		**Argument complexity**
Post simulation judgement		Multiplist epistemology (3)
Test for adequacy		Potential multiplist epistemology (2)
Post judgement stimulated recall	Q1	Absolutist epistemology (1)
	Q2	Absolutist epistemology (1)
	Q3	Absolutist epistemology (1)
	Q4	Multiplist epistemology (3)
	Q5	Absolutist epistemology (1)
	Q6	Absolutist epistemology (1)
	Q7	Multiplist epistemology (3)
	Q8	Absolutist epistemology (1)
	Q9	Potential multiplist epistemology (2)
	Q10	Multiplist epistemology (3)
	Q11	Absolutist epistemology (1)

Case Summary - Phase 2:

This participant constructed a focal universe of 72 elements for this phase. No researcher prompts were required. Information Reception instances exceeded information processing instances (37/35). Of the 13 simulation derived questions seven of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. There were also two examples of potential multiplist epistemological and four examples of multiplist epistemological reasoning. In response to the Test for Adequacy the participant's response was no and supported this by potential multiplist epistemological reasoning. The nature of reasoning was almost balanced between pseudoevidence and correspondence evidence (48/44). There was also two examples of covariation evidence and one example of counterfactual evidence.

Naturalistic reasoning tendency = Absolutist epistemology (7)

Phase 3: (Participant 2)

Table 7.5.47 Focal Universe and Think Aloud Characteristics:

Focal Universe	**Researcher Prompts**	**Information Reception**	**Information Processing**
75	0	35	40

Table 7.5.48 Categorisation of Argument Complexity (Participant 2, phase 3)

Data category	**Argument complexity**
Post simulation judgement	Potential multiplist epistemology (2)
Test for adequacy	Potential multiplist epistemology (2)
Post judgement stimulated recall Q1	Absolutist epistemology (1)
Q2	Potential multiplist epistemology (2)
Q3	Absolutist epistemology (1)
Q4	Absolutist epistemology (1)
Q5	Absolutist epistemology (1)
Q6	Absolutist epistemology (1)
Q7	Absolutist epistemology (1)
Q8	Absolutist epistemology (1)
Q9	Absolutist epistemology (1)
Q10	Absolutist epistemology (1)
Q11	Potential multiplist epistemology (2)
Q12	Absolutist epistemology (1)
Q13	Multiplist epistemology (3)
Q14	Multiplist epistemology (3)
Q15	Absolutist epistemology (1)

Case Summary - Phase 3

This participant constructed a larger focal universe of 75 elements for this phase when compared to phase two. No researcher prompts were required. Information processing instances exceeded information reception instances (40/35). Of the 17 simulation derived questions 11 of the participant responses were categorised as being of an absolutist epistemology and were thus judged to represent the Naturalistic Reasoning Mode. There were also four examples of potential multiplist epistemological and two examples of multiplist epistemological reasoning. In response to the Test for Adequacy the participant's response was equivocal, and supported this by potential multiplist epistemological reasoning. The nature of reasoning was predominantly characterised by correspondence evidence (65). There was also multiple examples of pseudoevidence (49) and two examples of covariation evidence and two examples of metacognition.

Naturalistic reasoning mode = Absolutist epistemology (11)

7.6 Composite of Participant Longitudinal Data

This section will present a composite of the results for the four phases of data analysis and subsequent statistical analysis of the differences between the phases. This will be followed by a description of the emergent observations relating to the data thus far.

Table 7.6.1 Composite Participant Results for Phases 1-4.

Case no	Phase 1	Phase 2	Phase 3	Phase 4	Argument complexity range – phases 2&3
1. (P52)	52	1	1	48	1&3 - 1-3
2. (P7)	68	1	1	63	1&3 / 1-3
3. (P4)	49	1	1	44	1 / 1-3
4. (P45)	53	1	1	54	1-3 / 1-3
5. (P33)	60	1	1	54	1-2 / 1-3
6. (P53)	50	1	1	52	1 / 1-2
7. (P30)	58	1	2	53	1-3 / 1-3
8. (P10)	46	1	1	47	1-3 / 1-3
9. (P8)	44	1	1	56	1-2 / 1-3
10. (P38)	53	1	1	46	1-2 / 1-3
11. (P37)	61	1	1	50	2-3 / 1-3
12. (P2)	51	1	1	63	1-3 / 1-3

Table 7.6.2: Differences in Participant Scores for Phases 1 & 4

Case	Phase 1	Phase 4	Difference
1. (P52)	52	48	-4
2. (P7)	68	63	-5
3. (P4)	49	44	-5
4. (P45)	53	54	+1
5. (P33)	60	54	-6
6. (P53)	50	52	+2
7. (P30)	58	53	-5
8. (P10)	46	47	+1
9. (P8)	44	56	+12
10. (P38)	53	46	-7
11. (P37)	61	50	-11
12. (P2)	51	63	+12

Table 7.6.3 Differences in Participant Scores for Phases 2 & 3

Case	Phase 2	Phase 3	Differences
1. (P52)	1	1	0
2. (P7)	1	1	0
3. (P4)	1	1	0
4. (P45)	1	1	0
5. (P33)	1	1	0
6. (P53)	1	1	0
7. (P30)	1	2	+1
8. (P10)	1	1	0
9. (P8)	1	1	0
10. (P38)	1	1	0
11. (P37)	1	1	0
12. (P2)	1	1	0

Participant score differences between phases were subjected to a paired sign test to determine whether these differences were statistically significant.

Paired Sign Test for Phase 1, Phase 4

# Differences > 0	7
# Differences < 0	5
# Differences = 0	0
P-Value	.7744

Fig. 7.6.1 Paired Sign Test for Phases 1 and 4.

The paired sign test was chosen because it is appropriate for non-parametric testing of a small sample of nominal data, that may or may not be correlated. Very few assumptions are made regarding the underlying distributions from which the data arise or the magnitude of the differences that exist between the paired data (Haycock

et al. 1994). The rationale in this case was to test for significant differences in WGCTA raw scores or argument complexity categorisation between the relevant phases. There were, however, insufficient changes between phases 2 & 3 to reveal significant differences.

The above analyses demonstrate that the differences in volunteer sample scores for the WGCTA and qualitative data analysis do not achieve statistical significance over the four phases. This is in keeping with the group mean scores for the WGCTA for phases 1 & 4

7.7 Summary of Results and Important Observations Arising from the Data.

- The group performance on the Watson & Glaser Critical Thinking Appraisal across phase 1 & 4 were unchanged.

- The Naturalistic Reasoning Mode for the group sample were predominantly (n=11) of an Absolutist nature and this remained unchanged across phases 2 and 3. This concurs with the group's unchanging results from phases 1 and 4.

- One case demonstrated a change in Naturalistic Reasoning Mode between phases 2 & 3. One case developed from an Absolutist Epistemology to a Potential Multiplist Epistemology.

- Individual WGCTA scores do not appear to relate to Naturalistic Reasoning Mode, i.e. higher WGCTA scores do not signify a higher level of Naturalistic Reasoning Mode. Conversely, lower WGCTA scores do not signify a lower Naturalistic Reasoning Mode.
- In this population, entry qualifications had no significant effect upon WGCTA scores.

- In this population gender had no significant effect upon WGCTA scores.

- All of the participants rely predominantly upon the weakest form of genuine evidence (Kuhn, 1991) to support their arguments regardless of the level of argument complexity.

- The volume of available or generated evidence (Focal Universe) does not appear to be related to the participants' level of argument complexity and Naturalistic Reasoning Mode (see table 7.7.1).

- There is little evidence of verbalised reference to formal theory during concurrent reasoning and stimulated recall reasoning.

- Where variance in argument complexity within cases is evident there is some evidence to suggest that metacognitive strategies or processes are used.

- The majority of participants' responses consist predominantly of their own knowledge structures, i.e. inductions constructed from evidence that is external to the simulation evidence.

- The volume of participant active information processing and information reception instances varies between participants but does not appear to have an effect upon the level of participants' argument complexity (see tables 7.7.2 & 7.7.3).

- Test for adequacy responses (i.e. whether the participant response is yes, no or equivocal) do not appear to relate to participants' argument complexity or naturalistic reasoning mode.

Table 7.7.1 Participant Focal Universe Size and Naturalistic Reasoning Modes for Phases 2 & 3. (P. = Participant, Absolutist = Absolutist Epistemology, PME = Potential Multiplist Epistemology).

Case No.	**Focal Universe- Phase 2**	**Naturalistic Reasoning Mode - Phase 2**	**Focal Universe - Phase 3**	**Naturalistic Reasoning Mode – Phase 3**
1. (P. 52)	26	Absolutist	31	Absolutist
2. (P. 7)	44	Absolutist	67	Absolutist
3. (P. 4)	56	Absolutist	61	Absolutist
4. (P.45)	65	Absolutist	85	Absolutist
5. (P. 33)	41	Absolutist	32	Absolutist
6. (P.53)	44	Absolutist	35	Absolutist
7. (P. 30)	85	Absolutist	91	PME
8. (P. 10)	49	Absolutist	51	Absolutist
9. (P. 8)	62	Absolutist	70	Absolutist
10. (P.38)	34	Absolutist	35	Absolutist
11. (P. 37)	74	Absolutist	58	Absolutist
12. (P. 2)	72	Absolutist	75	Absolutist

Table 7.7.2 Participant Information Reception Instances and Naturalistic Reasoning Mode for Phases 2 & 3.

Case No.	**Focal Universe- Phase 2**	**Naturalistic Reasoning Mode - Phase 2**	**Focal Universe - Phase 3**	**Naturalistic Reasoning Mode – Phase 3**
1. (P. 52)	8	Absolutist	11	Absolutist
2. (P. 7)	7	Absolutist	14	Absolutist
3. (P. 4)	18	Absolutist	20	Absolutist
4. (P.45)	15	Absolutist	49	Absolutist
5. (P. 33)	15	Absolutist	7	Absolutist
6. (P.53)	2	Absolutist	0	Absolutist
7. (P. 30)	38	Absolutist	34	PME
8. (P. 10)	14	Absolutist	19	Absolutist
9. (P. 8)	27	Absolutist	44	Absolutist
10. (P.38)	0	Absolutist	3	Absolutist
11. (P. 37)	25	Absolutist	19	Absolutist
12. (P. 2)	37	Absolutist	35	Absolutist

Table 7.7.3 Participant Information Processing Instances and Naturalistic Reasoning Mode for Phases 2 & 3.

Case No.	**Focal Universe- Phase 2**	**Naturalistic Reasoning Mode - Phase 2**	**Focal Universe - Phase 3**	**Naturalistic Reasoning Mode – Phase 3**
1. (P. 52)	18	Absolutist	20	Absolutist
2. (P. 7)	37	Absolutist	53	Absolutist
3. (P. 4)	38	Absolutist	41	Absolutist
4. (P.45)	50	Absolutist	36	Absolutist
5. (P. 33)	26	Absolutist	25	Absolutist
6. (P.53)	42	Absolutist	35	Absolutist
7. (P. 30)	47	Absolutist	57	PME
8. (P. 10)	35	Absolutist	31+1NFU	Absolutist
9. (P. 8)	35	Absolutist	26	Absolutist
10. (P.38)	34	Absolutist	32	Absolutist
11. (P. 37)	49	Absolutist	39	Absolutist
12. (P. 2)	35	Absolutist	40	Absolutist

Further discussion of these results in relation to the research questions and the literature will be addressed in the subsequent discussion chapter.

CHAPTER EIGHT

DISCUSSION

8.1 Introduction

The aim of this chapter is to critically appraise the methodology and results of the study in relation to the research questions and place them in context of the previous and emergent literature. The first step in this process is to restate the original purpose, and the research questions, that this study sought to address. These are as follows:

1. Does the current institutional Common Foundation Programme facilitate the development of critical thinking ability in student nurses?

2. Can critical thinking be identified in student nurses' concurrent professional reasoning processes?

3. Does student nurses' reasoning change in complexity over the course of the Common Foundation Programme?

8. 2 Research Question One:

The results generated from the two independent study methods in relation to this population demonstrate that:

the curriculum as an intervention has not resulted in changes to the group's performance in critical thinking ability as measured by the Watson & Glaser Critical Thinking Appraisal (1991) at the end of the Common Foundation Programme;

the curriculum as an intervention has not resulted in changes to the population sample's critical thinking ability as characterised by their Naturalist Reasoning Mode at the end of the Common Foundation Programme.

In relation to the first point, this is evident primarily in the minor differences demonstrated in the group WGCTA mean raw scores and standard deviations for the pre and post test phases 1 and 4 (Table 7.2.1, p.230). The decrease in variance shown also supports the fact that scores for phase four were more homogeneous with regard to test performance (Hicks, 1990).

The group results of the WGCTA five sub-test raw scores also revealed no significant differences in performance (Tables 7.3.1 - 7.3.5, pp.232-235) over phases 1 and 4. The group as a whole consistently scored lowest on the inference sub-test across both phases. This aspect of WGCTA performance is also important in the volunteer samples' Post Simulation Judgement and Stimulated Recall responses which contribute to their Naturalistic Reasoning Mode categorisation. Several inferential shortcomings, as described in the psychological literature, are evident in the reasoning of participants' responses categorised as representing an absolutist epistemology (These are discussed in response to research question 2).

In addition to the effect of the formal curriculum as an intervention, the general college, maturation and hidden curriculum effects, as outlined by McMillan (1987), do not appear to have contributed to change in the group's performance at this point.

Results such as these are not unique and are congruent with previous North American studies, relating to critical thinking as an outcome of nursing education that used the WGCTA as an instrument (Matthews & Gaul, 1979; Valiga, 1983; Bauwens & Gerhard, 1987; Fleeger 1987; Sullivan, 1987; Kintgen-Andrews, 1988).

Each found that programmes of nursing education had no significant effect upon critical thinking ability as measured by the WGCTA.

With regard to these findings, issues affecting the possible reliability of the data have to taken into account. Some caution is, therefore, required in the interpretation of these results in light of the issues raised in chapter four, particularly in relation to test - retest reliability. A variety of factors could contribute to individual performance and measurement error on both tests, e.g. health status, anxiety producing life events, motivation levels, discomfort, and guessing (Kline, 1993). Another important test - related issue is the difficulty of items. If test items are too easy for participants then the test - retest reliability will be very high. Conversely, items that are difficult for participants will produce a low test - retest reliability. Given the level of the group's mean scores, in the test and re-test phases when compared to the norm tables presented, the latter may be more reflective of the group's test experience and to some extent may have contributed to the results achieved. Given the group's composition in regard to entry qualifications, one might expect that the sample of individuals who entered the programme with informal qualifications (Group 3: n=10(23%), Fig, 7.4.5, p.245) would conceivably have experienced greater difficulty with the test items. Results demonstrate, however, that no significant differences in scores were attributable to this variable (Fig, 7.4.6, p.245).

Sample size also needs to be considered, in that most statistical indices have standard errors indicating how reliable the results are. Kline (1993) suggests that in order to minimise such statistical error samples of approximately one hundred, should be considered. Thus, the sample used in this case study may be subject to such limitations. Moreover, McMillan (1987) cautions that instruments such as the WGCTA may not be sensitive enough to find changes in critical thinking over short periods of time, as in the case of a single course or semester. Conversely, the WGCTA could be viewed as effective in terms of discrimination in that the group's

levels of critical thinking were unchanged and the results portray the test reliability in stability over time Videbeck (1997) adds another caution to the interpretation of pre and post tests scores using standardised instruments where a gain in score, leads to inferences of changed ability. For example, she posits that instruments designed to measure specific attributes are by nature static and there:

> "...is a high correlation across two points in time if the measure is valid and reliable. Thus to pre and post test with the same instrument, and use the difference as a change score either yields few or no measurable results of change, or calls into question the reliability and validity of the instrument if the change score is significant", (p.9).

Such a view, however, appears to rule out any possibility of a valid and reliable instrument ever being able to capture significant improvement in individual performance and may reflect the general criticism of the psychometric approach in relation to the notion of 'true score' (Rust & Golombok, 1989).

Strategies to overcome some of the issues related to test - retest reliability have, however, been utilised in the study procedures to increase confidence in the results, in that a time gap well in excess of three months between test administrations was incorporated. Clear and consistent test instructions, as stipulated by the test authors, were implemented for both administrations, to overcome the possibility of improved performance, due to differences in the quality of test preparation for participants (Kline, 1993).

On balance, when viewed against the supporting evidence in relation to evidence produced upon completion of phases two and three, the results pertaining to the group's unchanging naturalistic reasoning mode (n=11) there is a case to suggest that the WGCTA score were indicative of a particular level of performance in critical thinking ability that remained unchanged despite the largely homogenous curriculum experience. The questions arising from these results are: given that the group

performances were unchanged across the four phases; and the independent variables of age, gender, educational entry qualification and 'college effects' do not appear to have a bearing upon them; then, what factors have contributed to this outcome? The possibilities are: could they be largely due to the individual; the instruments; the curriculum or a combination of all of these factors?

With regard to the second possibility, an outstanding issue with regards to the WGCTA, is the concern of commentators who suggest that because the test is not domain specific then it may not relate to the performance of individual's reasoning in domain specific situations. In this respect, if the test is designed to measure critical reasoning about general everyday issues, and a programme of professional education is designed to incorporate such reasoning into domain specific issues, then the test scores may only reflect an unchanged level of performance in regard to the former, with little impact upon the latter. McPeck (1984; 1990) concurs with this position and argues that a central prerequisite for critical thinking is a body of domain specific knowledge. Similar arguments have focused upon thinking skills instruction with several commentators claiming that such instruction should concentrate on domain specific problems because thinking skills are most likely to be utilised when the conditions for their use is easily recognised (Chi et al. 1982; Bransford et al., 1986). In respect of these arguments, the development of the domain specific think aloud and stimulated recall method employed by this study would conceivably have been more sensitive to critical thinking skills than the WGCTA, if, critical thinking ability had been incorporated into the students' reasoning strategies. (notwithstanding the absence of specific critical thinking skills instruction). This, however, as the results suggest, has not proven to be the case despite the use of two independent instruments, and could thus question the necessity of domain specificity in reasoning tasks. The alternative possibility of task appropriateness has also to be considered here, in that a different cognitive task or a different client simulation may have

produced different results. A test for future research would be, however, to apply the think aloud and analytic methodology to a variety of tasks and simulations.

The evidence of this study does, however, conflict with several previous studies that did find evidence that American nursing education had a positive effect upon students' critical thinking abilities as measured by the WGCTA (Berger, 1984; Gross Takazawa & Rose, 1987; Miller, 1992). A more recent study by Pepa et al. (1997) used the WGCTA to investigate the potential differences between pre and post test scores for traditional (n=45) and accelerated (n=43 non-nursing graduates) undertaking the same nursing education programme. The findings revealed a significant increase in the traditional nursing students WGCTA scores but not of the accelerated student's scores. The findings regarding the accelerated student's scores lend support to the assertion of McMillan (1987) that students beginning a course with high scores on a measure of critical thinking will be unlikely to show statistically significant improvements because the instrument used may not be sufficiently difficult or discriminatory to show a difference in performance (ceiling effect).

Some of the individual results of this study, however, show a paradox, in that some participants with higher pre test WGCTA scores actually demonstrate a regression in their post test scores (Table 7.6.1, e.g., cases 2, 5 & 11, p.288). Possible explanations for these events are that these students were more careless or demotivated during the second test, or this could represent, the phenomenon of regression to the mean (Garnham & Oakhill, 1994). This is a complex statistical phenomena but essentially refers to the possibility that people have an average performance on tests, and in pre test post test situations, they may score above and then subsequently below their average, or, vice versa. Consequently extreme or above average scores are an aberration and not truly reflective of average performance. For this reason the individual WGCTA scores could not be used as predictors of performance or of success in pre-registration nursing education.

When compared to United Kingdom and North American norm tables it is also apparent that this population's mean scores were lower, even though, the group undertook an untimed test (Tables 7.3.6 - 7.3.11, p.241). Great caution needs to be exercised in interpreting the psychometric evidence in light of the small sample and case study design of this study. The evidence from phases 1 and 4, thus, adds to the body of evidence that does not support the assertion that nursing education develops critical thinking abilities in nursing students. The psychometric evidence, however, as previously identified does not provide insights into the actual reasoning processes of individual students in the way that the study's additional methods have been designed to illuminate.

Another caution in regard to these results also needs to be reported in regards to curricular outcomes regarding nursing competence. Such evidence has to be seen in the context of the specific construct under investigation and should not be extrapolated to the alternative issue of nursing competence as an outcome of nursing education. The issue of whether critical thinking is an essential component of general nursing competence has not been addressed in this study or in many of the above examples. Although it would be difficult to assume that an individual could develop professional competence without concomitant critical thinking skills, to what degree, one is related to the other is still undetermined (Stark et al. 1986; Maynard, 1996). Moreover, Matthews & Gaul (1979); Pardue (1987); Brooks & Shepherd (1990) and Pless & Clayton (1993) demonstrated non-significant relationships between critical thinking ability and clinical reasoning abilities.

8.3 Research Question 2

The development of the client simulation, think aloud and data analysis strategies have afforded significant evidence concerning the way that the participants in this sample have reasoned about a complex professional issue. In so doing, the methodology has also provided evidence of aspects of critical thinking as defined in chapter two. The findings will, thus, be evaluated in relation to this, and the recent literature involving qualitative approaches to investigating critical thinking in nursing. The systematic analytic strategy, and results for phases 2 and 3, have outlined how each participant's verbal responses to the cognitive task and stimulated recall questions were categorised in relation to argument complexity as an index of critical thinking.

The instrumentation developed for phase two and three has proved capable of illuminating certain aspects of critical thinking as portrayed in the argument complexity of participants' responses to the simulated domain -specific cognitive task. The majority of participants, however, do not demonstrate critical thinking ability consistently within their individual responses to the simulation, or, across phases.

With the exception of one case, the majority of participants have consistently demonstrated a naturalistic reasoning mode reflective of an absolutist epistemology across phases two and three. Reasoning of this nature violates not only the definition of critical thinking proposed, but also a number of the discrete characteristic affective dispositions, the cognitive skills, intellectual standards and the contextual abilities related to critical thinking (Chapter 2). These issues will, thus, be evaluated in this context.

8.3.1 Characteristics of Participants' Absolutist Epistemological Reasoning.

Reasoning from an absolutist epistemology is defined in the scale developed to categorise argument and epistemological complexity as follows:

Low unifocal - moderate differentiation and low integration: i.e. low or moderate differentiation culminating in a one-sided or single theory structure argument reflecting a narrow perspective, with little search for, or utilisation of, opposing evidence, non consideration of alternatives or context and early closure (Absolutist Epistemology).

Evidence arising from the qualitative data demonstrates that participants who reason from this epistemological perspective characteristically construct my-side or single theory structure arguments. These responses do not include the search for or generation of alternatives, in the form of other views or possibilities where their claims or assertions could be inaccurate or ambiguous in the face of additional evidence or perspective. Graphic representation of participants' response structures identify two predominant models of reasoning whereby participants either: respond to the questions posed with a primary conclusion, which they then support, with evidence that solely supports that conclusion and which may be repeated at the end of the reasoning sequence; or, they initially provide supporting evidence which then leads to a terminal my-sided conclusion. Both models may or may not include, intermediate conclusions. An example of one these models is presented below:

Table 8.3.1 Example of Absolutist epistemological reasoning with primary conclusion.

Participant 30, phase 2, question 2.

Researcher (R) - "What made you think he (Billy) was probably in his thirties."

Participant (P) -

Data	Integrative complexity	Focus	Boundary of Evidence	Nature of Reasoning & Evidence
U1 "Just experience I suppose	Int	Experiential evidence as basis for conclusion	External	My- side conclusion, causal element, correspondence evidence.
U2 "an from looking at him I guessed from y'know - guessing from experience he was about that age	Diff	Appearance as experiential indicator of age estimation	External	My-side, causal element, correspondence evidence.
U3 "And then he talked about the age of his children - it confirmed my ideas	Diff	Children's ages as confirming principle	External	My-side, causal element, correspondence evidence.
U4 " So I just - yeah - based it on my own experience as for - of the stage he was at and what age he looked like.	Int		External	My-side conclusion.

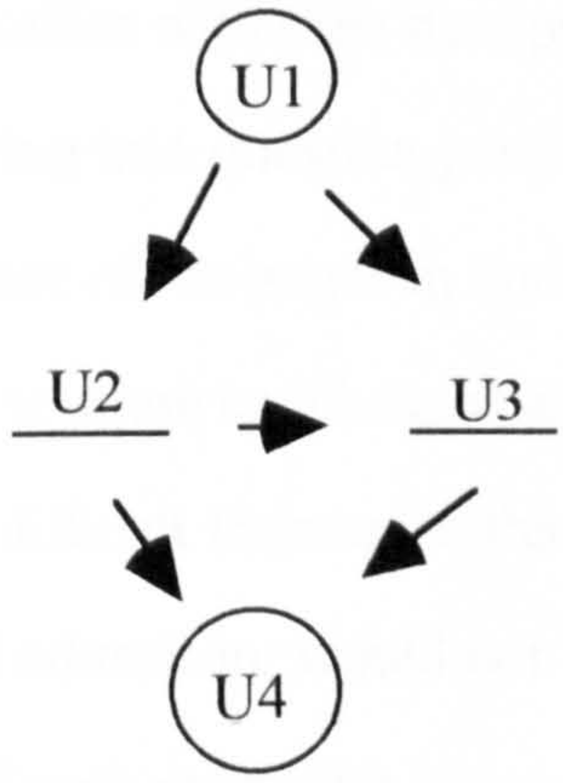


Fig. 8.3.1: Representation of Absolutist epistemological reasoning with primary conclusion: (Participant 30, Phase 2, Question 2).

The above example clearly demonstrates an initial conclusion where the participant stipulates that experience (external knowledge structure) was a sufficient basis upon which to determine Billy's age. This conclusion is then supported by the two further

dimensions, where experience in relation to the nature of Billy's appearance or looks and the age of Billy's children enables the participant to estimate Billy's age. This sequence is further supported by a reaffirmation of the original conclusion in combination with the other dimensions.

This exemplifies a single theory or my-side only argument representative of an absolutist epistemology. The participant gives no thought to alternative contextual possibilities that could refute such a conclusion, for example, possible instances where individuals' appearances are incongruent with their chronological age. There are many examples where people look much older than their years, or where people look younger than their years. Peoples' lifestyle choices, occupation, health status ethnicity have some bearing upon their appearance, and given these possible dimensions, will increase the variability of this phenomena. Secondly, the age of people's children in current society must be seen as a poor indicator of age, in the context of individuals choosing to have children later in life, and the increase of second marriages, where people with older children from one marriage choose to start new families with their new partners. This particular approach to reasoning must also bring into question people's perception of their experiences in respect of the occurrence of the issues in question, and their acceptance of this as a factual basis upon which to draw conclusions about the world. In the case of the above example, it would be difficult to imagine that an adult who is also undertaking a course in professional education, would not have encountered individuals who violate the principles of such reasoning, yet do not take account of these, in their everyday or domain specific reasoning. Another important consideration in regard to reasoning of this nature is, how would such reasoning contribute to the professional decision making or professional perception of the nature of patient's health needs, or the nature of the nurse-patient relationship?

The above example is not wholly characteristic of the sample's range of argument structures that appear within the absolutist epistemology category. Whilst Fig. 8.2.1 reveals a simple structure incorporating only two conclusions and two intervening differentiations, other participant structures reveal a variable number of dimensions that may progress through several referent changes each in turn containing a number of sub-elements prior to arriving at a conclusion. In relation to argument complexity though, these elaborate structures, may be less complex than responses that contain fewer dimensions or referents but reveal alternative theory structures that contrast with the original or prevailing theory.

The volume of the evidence itself in these instances is, therefore, of secondary importance to the structure complexity of the responses, in that some participants' arguments are quite detailed in the number of elements involved, yet the structure of their arguments are simplistic, because they do not consider alternatives and are thus constrained within a single theory structure. This characteristic absolutist reasoning parallels that found elsewhere (Kuhn, 1991; Perkins et al. 1991), in that absolutist epistemologists or individuals whose arguments reflect my-side situation modelling do not generate opposing arguments to their original theories or conclusions.

For those that use them, the correctness of single theory structures is thus by their very nature a given or self-evident truth. This contrasts to structures that are at least subjected to the generation of alternatives that could be just as true (multiplist epistemology), which ultimately are subjected to a complex critical evaluation of the variety of possibilities (evaluative epistemology).

The nature of the evidence used by participants in their responses was predominantly correspondence or pseudo evidence. Some instances of stronger evidence (covariation and correlated change evidence) were identified, but did not generally contribute to the formation of more complex arguments (see case summaries, p.244).

Many responses, thus, reflected a combination of descriptive attempts to construct plausible responses that explain how situations or events could occur, and causal elements where phenomena were linked to either the causal antecedence or consequence of the issue at hand. Very few participant responses comprised a singular type of evidence. Where this did occur the responses were very brief and tended to reveal that the participants were either reticent or unable to pursue a particular question. These responses generally comprised pseudoevidence, non-evidence or utterances that were categorised as having no functional uniqueness or utility (NFU).

Correspondence evidence is described as the weakest form of genuine evidence (Kuhn 1991), in that it only establishes, in the mind of the reasoner, a possible link between the phenomena identified and the issue at hand. This link, thus, serves as a possible premise within the argument structure because it is used as an element that has a bearing upon the correctness of the conclusion or outcome. Correspondence evidence is, therefore, superior to pseudoevidence, in that it is definitive. This is an important factor in arguments that suggest that the use of particular evidence types merely reflect alternative explanatory styles or preferences or that it is used to support individuals causal inferences that portray confirmation or belief biases (Shultz, 1982; Schustack, 1988; Baron, 1988;Evans, 1989). Explanatory styles of reasoning are thus viewed as less definitive than styles that utilise causal links to construct and support arguments. The issues of confirmation and belief bias are central to the evidence of this study, in that individuals arguments, that were categorised as being of an absolutist epistemology, appear to be biased by their initial beliefs or hypotheses. The evidence thus demonstrates that, regardless of the nature of the evidence used, the responses tend towards the support of initial hypotheses at the expense of the evaluation of evidence in the generation of alternative theories. This strategy, thus, maintains the validity of the original theories because objections

to that position, or the information contained within them, are not raised or challenged (Stein & Miller, 1991).

The predominance of the weaker forms of evidence utilised by the participants, however, could also be a consequence of a variety of additional factors. This could, for example, be influenced by their stages of knowledge development in relation to the curriculum, the abstract nature of health as the cognitive task and the degree of nursing related empirical evidence available related to this task.

According to Kuhn (1991) those people reasoning with absolutist arguments enjoy a high degree of personal certainty regarding their theories because they view knowing as factual, objective and simply cumulative. As a result of this perspective absolutist epistemologists tend to believe that argument is superfluous. One possible explanation for this particular approach to reasoning is that absolutist epistemologists do not have the resources to reconcile alternative views. They, thus, try to reconcile divergent views with their own by the reliance upon their arguments as facts that should encourage those holding alternative views to compromise in favour of their view. Kuhn does not, however, stipulate whether the lack of resources in dealing with divergent perspectives is due to a lack of cognitive resources or the lack of affective dispositions, such as scepticism, perseverance or a tolerance of ambiguity. The nature of the participant's reasoning structures should thus be evaluated in relation to this study's model of critical thinking.

8.4 Absolutist Epistemological Reasoning in Relation to the Conception of Critical Thinking.

The conception of critical thinking developed for the purpose of this study incorporates four interrelated elements, each with their specific constituents

encompassed within a definition of the construct. The definition is repeated here for the readers benefit:

> Critical thinking is autonomous, purposeful, reasoned thinking that enables an individual to determine the authenticity, accuracy, consistency, objectivity and worth of information, arguments and knowledge claims (Beyer, 1985), by avoiding the indiscriminate acceptance of one-sided (Face value) arguments, and avoiding the indiscriminate construction and defence of one-sided arguments.

As aforementioned, a characteristic of this study's methodology is that participants were not prompted to elaborate upon their initial responses. This was in order to reflect their levels of autonomous or self-directed reasoning strategies espoused as a characteristic of critical thinking as defined above. The evidence from phases two and three, thus, suggests that given the group sample's overall naturalistic tendency towards absolutist reasoning, they do not demonstrate the tendency to avoid the construction and acceptance of one-sided arguments. There appears also to be little consistent application of the dispositions of inquisitiveness, scepticism, resistance to early closure, desire to search for evidence, open-mindedness, metacognition and tolerance of ambiguity. The contribution of the non-application of these dispositions to the participants' reasoning performances is discussed below.

8.4.1 *Participant reasoning in relation to characteristic affective dispositions of critical thinking.*

8.4.1.1 *Scepticism:*

With regard to the disposition of scepticism, many responses were, for example, sceptical or even cynical in respect of Billy's assertions and the motives underpinning these, yet that scepticism was not extended to their own reasoning about Billy. Thus,

many arguments criticising Billy's one sided or vested interest behaviours were substituted for their own single perspective reasoning that also portrayed a lack of open-mindedness, inquisitiveness, or flexibility. Many of these arguments also reflected biased gender role, cultural, health behaviour and lifestyle expectations. Scepticism regarding the contextual issues surrounding Billy's situation was in many instances not demonstrated, particularly in relation to Billy's relationship with his family, his efforts to find work, his age, his sleeping patterns, the family's nutritional status and length of unemployment. There were many contextual circumstances that could be considered in relation to the rationale and validity of Billy's behaviour that were essentially overlooked in favour of prevailing theories.

Examples of these referred to the fact that Billy arose from bed at midday on most days. As a consequence of this several participants inferred that Billy was by nature a lazy person and that this deliberate strategy excluded him from the early morning division of labour in relation to preparing the older children for school and the feeding of the baby. Little consideration was actually given to the hour that Billy may have retired, whether he stayed up late to study for his correspondence course, what his prevailing sleeping patterns were, whether aspects of his course work or employment search information was televised in the early hours or whether he and his wife preferred or had negotiated this pattern (P. 33, phase 3, Q1, P. 7, phase 3, Q.4, P. 30, Phase 3, Q1).

8.4.1.2 Tolerance *of Ambiguity :*

Absolutist epistemologists did not characteristically demonstrate a tolerance for ambiguity. Instead, they sought the security of one-sided arguments with definitive terminal conclusions based upon limited evidence and no consideration that issues may not be amenable to the formulation of such conclusions or right answers. Conversely, multiplist responses were characterised by responses that not only

considered alternatives but also left responses open-ended without explicit evidence of closure in the form of one-sided conclusions.

8.4.1.3 Resisting *Early Closure:*

Resistance to early closure was not a feature in the reasoning of those making absolutist epistemological responses. This is evident in many of the models which are similar to those in Fig. 8.3.1. There are, however, instances where some participants appear to avoid early closure, by constructing prolonged responses that elaborate upon premises and descriptions of plausible operation of the premises. These examples are often characterised by mere repetitions of former utterances. The critical point in these examples, is that although it appears that participants do not appear to rush to a snap judgement, the responses are nonetheless impoverished as a consequence of the non-generation of alternatives and counterevidence. The reasons for this approach are conceivably underpinned by the very complex issue of the individual recognition of evidence sufficiency, which is beyond the scope of this current study. There were contrasting examples, however, to the elaborate single structure responses, whereby the participants' responses may not have been as lengthy as some others, but nonetheless were categorised as more complex, because by nature they demonstrated alternative theory structures that were not integrated into an original theory. These were essentially open-ended responses that resisted definitive closure and therefore categorised as of a multiplist epistemology.

8.4.1.4 *Open- Mindedness :*

Open-mindedness was not evident in any of the absolutist participant responses. This indeed was the critical criterion for higher levels of categorisation, in that it enables the avoidance of single theory or my-side biased arguments by the envisioning of alternative theories and perspectives. When open-mindedness was evident it was either transient as in the reasoning of the potential multiplist category, where

alternatives were ignored or distorted in favour of the original structure or in the multiplist category where alternatives were generated in an open-ended argument structure.

The above examples not only provide insights into the critical thinking shortcomings of absolutist epistemologists in relation to this particular population and method, but also, demonstrate the interrelationships between the discrete dispositions in the integrated practice of critical thinking. As previously discussed the characteristic affective dispositions serve as the vehicle or carriers of a range of cognitive skills that also contribute to the model of critical thinking. Their relationship to absolutist epistemological reasoning and critical thinking will now be addressed.

8.4.2 *Participant Reasoning in Relation to Cognitive Skills and Critical Thinking.*

8.4.2.1 *Selective Attention*

With regard to selective attention, the participants consistently demonstrated the ability to fully engage with the simulation and cognitive task with little evidence of loss of concentration, distraction or disinterest. Collectively they were able to remain focused and required little recapitulation of trains of thought, or repetition of information, from the researcher. This, however, has to be viewed in the context of the semi-controlled laboratory environment, and the absence of competing extraneous stimuli that would be a feature of real-time clinically situated professional reasoning. The transference of this skill to the clinical practicum could, therefore, be problematic.

8.4.2.2 *Interpretation* :

In many of the responses the participant's interpretation was demonstrated by information reception utterances that merely repeated the information emitted from the simulation and was, thus, generally accurate. Where the participant's

interpretation often conflicted with the critical thinking model was during active information processing instances where the interpretation and subsequent conclusion was informed by erroneous inferences. An example of this is:

> " He's wallpapering." (P. 30, phase 2, think aloud data), "when he thought the electricity was getting on too high - he's just switch off the computer." (P. 4, Phase 2, PSJ), he sold his golf clubs... he must have been desperate (P. 33, Phase 3, Q.13), "So - seems they are managing to survive within the two incomes" (P. 10, Phase 2, Q.3 U4).

An alternative example occurs when the interpretation of evidence, was founded upon either biased or cynical perspectives, e.g.

> " I don't like to think of people lying in bed until 12:00." (Midday), (P. 7, Phase 3, Q.4), "Because I wouldn't be happy with the situation if it were me" (P. 33, Phase 2, Q. 5).

Some of the utterances were also of a meta-perceptive nature whereby the participant offered insights into how Billy was thinking e.g.,

> " He thinks that life should go - continue as it did before", (P38, phase 3, Q.3 U5). "It's like (Billy thinks) the world owes him something now because he's unemployed", (P38, Phase 2, Q.5, U2). "I think he must be aware that it (alcohol consumption) is heavy", (P2 phase 2, Q.10, U2). "I think he knows there could be improvements", (P2, phase 3, PSJ, U3).

This type of vicarious perception were obviously derived from participants' ontological constructs based upon their personal experiences, values and beliefs but without the benefit of Billy's clarification or reinforcement. Such interpretations thus serve as the grounds or premises for further stages in the reasoning process and the application of other cognitive skills. These examples serve to demonstrate the importance of interpretation in the early stages of reasoning and their possible influences upon subsequent argument construction i.e., that if information is perceived or encoded from a biased or erroneous perspective then it appears likely, in this sample, that the responses will be contained within this type of situation

modelling. Thus, if individuals do not question or clarify the accuracy or fairness of their interpretations of information at the outset of a reasoning process, then the resultant situation modelling could be impoverished. Evans (1989) suggests that such processes are actually heuristic strategies that are not deliberate, but relate to the automatic and preconscious stages of comprehension. Evans asserts that this phenomenon represents a matching bias and that it occurs before any analytic processes are brought to bear on the issues at hand. The educational task in regard of these processes would appear to be directed towards enabling individuals to recognise their automatic matching biases during the interpretation and comprehension stages of professional judgement.

8.4.2.3 *Analysis*:

The participants demonstrated analytic ability by the generation of differentiations and discrete foci that contributed to their overall conclusions. The analytic processes evident in the examples of absolutist epistemological reasoning, however, conflict with the conception of critical thinking, in that the analyses served to support the one-sided arguments characteristic of this type of reasoning. In relation to the spectrum of uncritical to critical models of reasoning and their potential impact upon beliefs and action (chapter 2, p.63) the absolutist epistemologist would conceivably stop at stage two due to a lack of ability or the absence of a disposition to process information further.

Interpretation has obvious implications for the processes of analysis in such instances, in that the deconstruction of the situation into its discrete constituents (differentiations) will be driven by the way that the information is initially interpreted. The relationships between these constituents will conceivably be dependent upon knowledge structures and beliefs that underpin this process. One of the stark omissions in analysis of absolutist epistemologists is the failure to recognise contextual contingencies as illustrated earlier. In those examples that more closely

reflected the conception of critical thinking, the development of a more diverse universe of constituents in the form of alternative theories and contextual contingencies were evident. These would, therefore, result in a more complex analysis of the issue at hand, and provide the foundations for more complex argument structures such as those characterised by the potential multiplist and multiplist epistemological categories.

8.4.2.4 *Inference:*

The inferential strategies demonstrated by those participants reasoning from an absolutist epistemology tended to characterise simple if-then stereotypical deductive inferences. Fig 8.3.1 exemplifies this type of inference as follows:

If a person looks a certain age;

If that person has children of certain ages;

Then that person is that certain age.

Another similar though more professionally salient example was portrayed by one participant in the form of: (Participant 7, Phase 3, Q.4).

If Billy lays in bed until 12:00;

If Billy has nothing to get up for;

then Billy is depressed.

Such inferential strategies have been reported in the psychological literature as inferential shortcomings (Nisbett & Ross, 1980; Tversky & Kahneman, 1973; 1986), in that they represent biased heuristics (rules of thumb or shortcuts to reasoning). Tversky & Kahneman (1986) suggest that during judgmental reasoning processes, particularly under conditions of uncertainty, people tend to rely on a limited number

of heuristic principles whose function is to reduce complex reasoning tasks to simpler judgmental operations. This built on the work of Simon (1959) who proposed the notion of bounded rationality as a reaction to flaws in utility theory (Edwards, 1954). Bounded rationality proposes that cognitive limitations force people to construct simplified models of problems and the solution to problems is based upon the satisficing principle, i.e. the first solution that has a satisfactory outcome as perceived by the individual is selected. Thus, instead of considering a large number of possible alternatives people use subjective probability judgements known as heuristics when making judgements. Such heuristics can be useful and appropriate in a general sense and in nursing practice may even reflect intuitive knowledge (Cioffi, 1997). Heuristics can, however, sometimes lead to systematic reasoning errors termed as: representativeness, availability, anchoring and adjustment (this particular heuristic relates to numerical estimation and, thus, is not relevant to the nature of the study's cognitive task). The application of these particular heuristic processes during reasoning thus results in biased judgements. There is also evidence that these reasoning strategies are not qualitatively improved by domain experience, volume of available evidence and education (Hogarth, 1981; Goldberg, 1986; Brehmer, 1986; Kuhn, 1991; Perkins et al. 1991).

The Representative Heuristic.

Many of the judgements in which people are concerned involve the cognitive tasks of assessing probabilities or predicting values (Kahneman & Tversky, 1986) Examples of such tasks are:

(i) What is the probability that object A belongs to class B? (e.g. council houses to working class families);

(ii) What is the probability that event A originates from process B? (e.g. staying in bed late originates from depression);

(iii) What is the probability that process B will generate event A? (e.g. consuming frozen food will result in poor nutrition).

The potential effect of the representative heuristic upon such tasks is that the probability of the occurrence of such processes and events are evaluated as being too likely or too unlikely based upon conceptions of the similarity of events to stereotypical belief frameworks. Tversky and Kahneman tested this phenomenon by asking subjects to match personality characteristics to likely occupations, e.g. what would be the probability that someone who is shy, retiring, orderly and helpful would be either a salesman, airline pilot, librarian or a physician? Subjects consistently linked such characteristics to the stereotype of a librarian. Similar evidence is portrayed in some of the absolutist epistemological reasoning of the think aloud participants, in the form of:

> If frozen food is stereotypically associated with a reduction in vitamins and nutrients, as opposed to fresh food, then it is probable that people who regularly consume frozen foods will have a poor nutritional status.

Such an approach to reasoning can lead to serious errors because people's judgements of similarity and probability are not sufficiently influenced by factors that should be taken into consideration. One such factor is the base rate frequency of outcomes, e.g. should the fact that there are many more farmers in the population than librarians and the proliferation of frozen foods and frozen food outlets alter the probability of the above outcomes? However, the fact that people reason by representativeness alone will result in the base rate frequency being neglected in favour of their stereotypical images. Insensitivity to sample size is another important factor, in that when people reason by representativeness their judgements will by and large be independent of sample size. Thus, the probable distributions of certain characteristics such as average height, weight or age will be the same in sample sizes of 10, 100 or even 1000. This approach tends to disregard the fundamental statistical notion that larger samples will tend to reflect averages more accurately. The

conceivable effect of such an insensitivity, is that individuals would be more likely to generalise the effects or contribution of phenomena to their judgements from small samples or scant experiences. This was also evident in the reasoning of absolutist epistemologists, whereby they tended to make definitive judgements from the limited evidence available within a ten minute video-taped simulation of one person's circumstances. Some participants, however, resisted this approach by acknowledging that a longer period of observation and the gathering of additional sources of evidence would be required before definitive judgements could be made. These types of responses were thus generally categorised at a higher level of argument complexity particularly in relation to the Test for Adequacy responses.

The illusion of validity also plays a significant part in reasoning based upon representativeness because such an approach is based on the goodness of fit between the input and output. Thus, if the evidence, however scanty or unreliable, fits with the reasoner's stereotypical conception of the issue or subject, then the internal consistency of the pattern generated is taken as an indicator of the validity of the outcome or judgement and results in a confident conclusion. Missing from these judgements, however, are the factors that should limit the predictive accuracy of such reasoning such as spurious correlations, irrelevant and contextually sensitive variables. Misconceptions of regression are also evident in many instances of absolutist epistemological reasoning, particularly in relation to the form illustrated by Tversky & Kahneman regarding the effect of reward and punishment upon behaviour or performance. The concept of regression essentially refers to the likelihood that extreme measures of performance will not be consistent. Thus, one excellent test score or athletic performance by an individual is just as likely to be followed by a poorer score or performance on subsequent iterations, that will be more representative of the mean distribution. Kahneman & Tversky (1973) claim that the phenomenon of regression is poorly understood because it is incompatible with the belief that predicted outcomes are directly representative of the degree or nature of

the input, and hence, the more you put in, the more you get out of any process or event. Failure to recognise the existence or importance of regression can have serious consequences for judgements. This is exemplified by Kahneman & Tversky's experiences with flight instructors by the recognition that when students were praised for a very good landing, this was typically followed by a poor landing. Conversely, students that were reprimanded harshly for a very poor landing, typically followed this with a good landing. The instructors erroneously concluded that verbal rewards were detrimental to performance while verbal punishments were beneficial to performance although this runs contrary to accepted psychological and educational doctrines of positive and negative reinforcement. Conclusions such as this are unwarranted because of the possibility of regression to the mean.

Similar examples of this approach are demonstrated in participants' reasoning in relation to some of Billy's perceived behaviours and antecedent motives. Many responses included such verbal punishments as " I'd tell him to get off his backside an get a job." or, I'd chuck him out - if he sat round all day playing computers." or, I'd soon stop him going out drinking with his mates." Such responses appeared to disregard the possibility that over the six year period of Billy's unemployment his levels of motivation and performance could have peaked and regressed. There could, therefore, be a possibility that the portrayal of Billy's behaviour in the simulation snapshot of Billy's circumstances could have represented a period of regression. Subsequently, this may have led to the experiences of Billy and his family, that effort, reinforcement and admonishment, do not consistently have the desired effect, and thus, the current status quo could have been arrived at by trial and error and a recognition that the family's needs are best met by their respective behaviours.

In summary, the representative heuristic is an inferential strategy used by people to make judgements regarding the membership of classes of phenomena based upon how closely the phenomena in question resembles the stereotypical examples of the

class. This judgement is typically made without the use of analytic method or deliberate calculation, and regardless of information that might conflict with the accuracy of the judgement. Reasoning of this nature has been identified by the methods employed in this study and is in conflict with the model of critical thinking and the application of the discrete cognitive ability of inference.

The Availability Heuristic

According to this heuristic the probability of an event, or whether or not an item has a particular property, is based upon the ease at which the evidence of such instances can be brought to mind, i.e. their availability in memory. Crucial elements in many judgements affected by the notion of availability is the size of classes, illusory correlation and psychological saliency as opposed to the accuracy of the evidence. The effect of this heuristic upon people's judgements is that highly publicised or personally salient events tends to make people overestimate the probability or accuracy of events or properties and can thus lead to systematic errors of judgement. Examples of this heuristic characterised many absolutist epistemological responses. Participants frequently made judgements about Billy's situation based upon salient personal experiences relating to unemployment, socialisation, reliance on computers for stimulation, complexity of chess, drinking behaviour, relationship with spouse and childcare issues. In these instances the search for conflicting contextual evidence or the generation of alternatives was not engaged in and, thus, participants tended to demonstrate early closure.

8.4.2.5 *Generation of Alternatives:*

The generation of alternatives is conceived of as a fundamental skill in critical thinking as discussed previously (chapter 2). One of the central omissions in the reasoning of absolutist epistemologists was the consideration or generation of

alternative possibilities in relation to issues in question. The result of this was that participant responses categorised as absolutist in nature were of a my-side nature that as aforementioned constructed and supported simple single theory, as opposed to more complex argument structures.

The four point argument complexity scale constructed in conjunction with the analytic framework enabled the identification of several levels of the generation of alternative theories within participant responses. These are as follows:

- Potential Multiplist Epistemology - The generation of an alternative theory that contrasts with the original theory explicit in the response, that is then ignored or distorted and thus integrated into the original structure at the expense of pursuing the alternative line of inquiry.
- Multiplist Epistemology - The generation of alternative theory that clearly contrasts with the original theory that is not clearly ignored or distorted and integrated into the original structure. The line of inquiry may not be rigorously pursued, but the argument structure is thus more complex and open-ended.
- Evaluative Epistemology - The further generation, not only of an alternative theory, but of a further counterargument that evaluates the alternative theory using genuine evidence and criteria in order to pursue the line of inquiry and arrive at a reasoned or justifiable conclusion.

The scale essentially encompasses increasing complexity from the mere generation of alternatives to the full critical evaluation of such alternatives (although the latter element of the scale was not demonstrated in the data). Kuhn (1991) asserts "The ability to conceive of counterarguments is fully as critical as the ability to conceive of alternative theories" (p.266). In the absence of the ability to generate alternatives and counterarguments the ability to thus examine the correctness of individual's own theories is limited and the result is essentially simple answers to complex problems as

demonstrated by absolutist reasoning. The generation of alternatives in instances of judgement and choice is said to differ from hypothesis testing, in that hypothesis testing uses both inductive and deductive processes in addressing a single proposition (Stevenson, 1993). In situations requiring judgement and choice, however, reliance on induction alone can result in reasoning errors, because theories based on experiences (inductions) can be restrained by prior knowledge and the bypassing of logical processes by direct retrieval from memory of well learned structures, e.g. attitudes or well learned procedures. This appears to be the case in the instances of absolutist reasoning, in that the participant's inductions appeared to reflect such rigid experiential or knowledge mediated structures in the absence of logical deductive processes, such as assessing the trustworthiness of evidence or identifying assumptions. It has thus been argued that induction has to be accompanied by deductive processes for sufficient hypothesis generation and testing, although the deductive processes can be over-ridden by the errors of induction derived from the heuristic processes outlined (Stevenson, 1993).

The non-generation of alternatives could also be explained by a phenomenon known as psychological essentialism that has similarities to the representative heuristic (Medin, 1989). Medin suggested that psychological essentialism was instrumental in people's concept formation behaviour. Concepts have not only a meaning but also a prototype or set of exemplars that enable us to pick out instances of the concept from events in the real world. Thus when we pick out examples of the concept we rely upon certain characteristics that contribute to the exemplar. Medin, therefore, argues that people adopt the hypothesis that things that look alike will share underlying principles. Moreover, people's theories provide the causal links from underlying principles to surface similarities and thus provide confirmation of those theories or judgements in keeping with the satisficing principle. These theoretical propositions could all provide insights into participant shortcomings in the generation

of alternatives. The reasons why people either choose not to, or are unable to generate alternatives is, however, beyond the scope of this current study.

Perkins, Farady & Bushey (1991) also found that peoples' everyday reasoning performances were marred by the absence of generated alternatives or other-side arguments (n=300). The absence of such alternative perspectives or evidence was said to represent biased and incomplete situation modelling of events. This, as in many of the instances demonstrated in this study resulted in impoverished reasoning structures that supported the initial conclusions or judgements of their participants. Arguments such as these were described as reflecting makes-sense epistemologies that were faulty in both bias and depth. Moreover, they reported that these findings were strongly suggestive that poor situation modelling was the norm as opposed to the exception, and that situation modelling of this nature, was not affected by levels of motivation, knowledge or general intelligence. Indeed, individuals intelligently but selectively support their my-sided arguments, as opposed to investing in the full and fair exploration of issues.

In summary, the results in relation to the participants' naturalistic tendencies not to consider or generate alternatives to their own arguments are largely in keeping with the findings of previous works. Research suggests that reasoning of this nature can be in many instances, perfectly adequate for everyday living and fits well with the human characteristics of an organism whose information processing capabilities are limited, as evidenced by bounded rationality. Thus, people can stop reasoning about issues when they achieve a superficial sense of completeness, as opposed to seeking out more complications. Furthermore, such superficial reasoning can provide a form of ego defence that does not require the individual to explore or challenge cherished beliefs about the self and the world thus avoiding the possibility of cognitive dissonance (Festinger, 1957; Paul, 1987). Important questions to emerge from such evidence are: firstly, to what extent could reasoning of this type be adequate for

nursing practice? Second, to what extent could a knowledge of these human characteristics of reasoning behaviour contribute to curriculum development and outcomes?

Although participants did display a capability for developing alternatives autonomously in some responses this was not consistently displayed, with the exception of one case, to the point where their assessed naturalistic reasoning mode would reflect this (See Question 3).

8.4.2.6 *Evaluation:*

The participants' performance in relation to this particular cognitive skill did not achieve the levels of evaluation as defined for the purposes of this research. Evaluation is held to exemplify the highest order of thinking in terms of the assessment methods employed in this study and by other commentators in the fields of education, critical thinking and reasoning (Bloom, 1965; Kallick, 1991; Kuhn, 1991).

No participant responses were categorised as reflecting an evaluative epistemology. It is obvious that the participants categorised as absolutist epistemologists were not using any form of evaluative process to arrive at their conclusions. This conclusion was based upon their generation of superficial one- sided levels of evidence. They also displayed characteristic levels of certainty regarding the validity of the evidence used in respect of the question posed. Kuhn (1991, p.202), however, believes that evaluative epistemologists demonstrate a combination of skills that "... lie at the heart of skilled argument." Evaluative epistemologists characteristically believe that absolute certainty is impossible and knowledge is viewed as the product of a continuing process of evaluation and judgement of different and competing evidence. A key component of evaluation is the argumentative skill of counterargument in respect of alternative theories. The key element in the development of a

counterargument is the use of genuine evidence that is weighed against other evidence and used as criteria for judgement on the understanding that the resulting conclusions may not be finite. Furthermore, the fundamental tenets of evaluative epistemologists reasoning are: the capability to think about or fully engage in a theory; and to contemplate the evidence supporting the theory as being fully integral to the theory and not just merely assimilated indiscriminately to it. Thus the weak assimilation or assignment of evidence to theories can cause confusion as to what should follow from a piece of evidence and what one believes to be true.

The naturalistic tendency of the participants as absolutist epistemologists tended to reflect the latter, in that participants merely assimilated their evidence to their theories, without fully contemplating whether their theories should follow from that evidence.

Evaluation skills, according to Marzano et al. (1988), involve assessing the reasonableness of theories and comprise the two discrete skills of establishing criteria and verification. The establishment of criteria and subsequent verification refers to the setting of standards for judging the value or logic of theories or claims. These criteria are thus rational principles that are ultimately derived from culture, experience and education. The crucial element of this process would appear to be that of rationality and the individual perceptions of this in the development of appropriate evaluative criteria. Given the proposition that humans (other than in purely physiologically mediated reflex actions) would seldom act in an arrational manner, then the notion of irrationality, must bear upon the value or worth of people's reasoning principles. Rational action is action carried out for the subjective reasons or purposes of the agent (Graham, 1993). Where rational behaviour and irrational behaviour differ is in the quality of the reasons or premises that underpin such behaviour. Thus, good behaviour or action is underpinned by good reasons and bad behaviour of action is underpinned by bad reasons. This, however suggests the

universal acceptance of good and bad reasons, and discounts the possibility of these categories being derived from a subjective point of view or perspective. Graham (1993) argues, however, that such reasons may be judged against either internal standards (those that solely meet the needs or beliefs of the agent) or by external standards (those for example, derived from moral, legal or scientific in conjunction with some internal criteria). With regard to the evaluative performance of the absolutist epistemologists the criteria for the reasons tended to be of the former. Evidence was thus generated and evaluated in respect of simple patterns of argument that met with the subjective theories and beliefs of the participant in the formulation of their judgements. The judgements however, would conceivably be judged as rational by the participants, for the reasons given above, in the absence of critical thinking skills, that contribute to the generation of more rigorous and veridical criteria that would be more reflective of an evaluative epistemology.

8.4.2.7 *Metacognition:*

Suffice to say absolutist epistemologists displayed little explicit evidence of metacognitive processes as defined in the model of critical thinking and the literature. When explicit evidence of such processes were revealed verbally, they tended to be instances of potential multiplist or multiplist epistemological responses. This particular aspect of cognitive skill will thus be addressed more fully in relation to research question three.

8.5 The Characteristics of Absolutist Epistemological Reasoning in Relation to Intellectual Standards:

Paul (1991) suggests that intellectual standards provide another framework for assisting in the evaluation of participants' reasoning performances with particular reference to: precision; accuracy; relevance; consistency; logicalness; significance; fairness and adequacy. Participant reasoning will be discussed in relation to these discrete standards.

8.5.1 *Precision:*

Precision is important in the expression of arguments and in this context refers essentially to language and the use of words within argument structures. O'Reilly (1991) argues that students need to be conscious of imprecise words that can allow assertions to blur troublesome issues. This of course, is extremely important to nursing practice, in regard to the communication processes between health care professionals and patients. A variety of imprecise terms were used in participants' responses. Examples of these were the use of terms such as "... lazy...","...too much...", "...not enough... ", "...more with it...", "...well off..." The imprecision within these terms would be that, e.g., people would have different ideas as to how much wealth would be required before one could be considered well off. Similarly, the question arises of how little or how slowly would one have to work to be classified as lazy? Perjorative terms such as this can also be used to add force to arguments in an attempt to sway the unwary to accept one-sided views. They may also be used consciously or unconsciously by absolutists to construct sophistic or one-sided arguments.

8.5.2 *Accuracy:*

Many participant responses reflected inaccuracies in information reception and erroneous inferences based upon misinterpretation of evidence as identified previously. Examples of this were evident in relation to Billy's employment search

strategies, volume of alcohol intake, levels of exercise, child care duties and budgeting responsibilities.

8.5.3 *Relevance:*

The majority of utterances were of relevance to the issues raised in the simulation and stimulated recall questions. When irrelevant utterances were demonstrated these were characterised by opinions regarding domestic decor, Billy's clothing, participants' personal abilities in chess or computing and their alcohol consumption capabilities.

8.5.4 Consistency:

Consistency was generally apparent in the majority of responses although this was characterised by consistency in maintaining the integrity of participants' theories. Consistency in negative attitudes towards Billy's behaviours were often maintained across the think aloud, post simulation judgement and stimulated recall phases. For example, if a participant stated that Billy was not contributing to family life or that he was not sincere in his job searching behaviour, this belief was restated again in several responses. Direct contradictions were evident in some participant responses. For example, one participant contradicted a position from one question to the next by asserting in one response that "...Billy had no hope for the future..." regarding finding employment. In response to the next question, however, the participant asserted that Billy is highly motivated because of his correspondence course, and that the skills gained from this will increase the likelihood of future employment (Participant 33, phase 3, Q. 18 &19). Potential multiplist responses also demonstrated inconsistency in pursuing lines of argument by ignoring alternative possibilities and returning to prior theoretical structures.

8.5.5 *Logicalness:*

Illogical reasoning strategies were mainly exemplified by the way many of the absolutist epistemologist conclusions did not meet the informal logic criteria of soundness and plausibility, as in the case where conclusions did not necessarily or plausibly follow from the participants' premises.

8.5.6 Depth *and incompleteness:*

Absolutist responses were characterised by superficial and incomplete reasoning in terms of the generation of single theory and my-side structures that were devoid of alternative possibilities and contextual contingencies. Greater depth and completeness was, however, achieved by potential multiplist and multiplist responses that did demonstrate these characteristics.

8.5.7 *Significance:*

Significance is obviously a matter of individual context and thus participant utterances were perforce of significance in the context of their respective arguments. Significance in terms of objective assessment, however, is a matter of degree to the extent that evidence represents sufficient grounds to warrant conclusions. The issue of omission of significant dimensions was an important factor in absolutist responses, in that they were either not generated or ignored. With regard to triviality this could be regarded in a similar light to the issue of irrelevant utterances as described above.

8.5.8 *Fairness :*

Fairness is an important constituent of critical thinking, in that it should facilitate the balanced open-minded appraisal of situations and arguments that takes a variety of evidence, beliefs, perspectives and possibilities into account before conclusions are formulated. This standard was not evident in absolutist responses in that the very nature of one-sided arguments does not demonstrate fairness in the ways described. An example of unfair or biased reasoning is demonstrated as follows:

Q.12 (R) "Was his drinking excessive do you think?"

(P) U1 "Yeah."

U2 "But I would - I guess it - that's my own personal influence."

U3 " Cause I'm not a drinker."

U4 " An I think that even one drink can influence a person's thought and body." (Participant 33, Phase 3, Q. 12)

Although the above example reveals this participant's knowledge of the influence that their views may have on their reasoning, it should not be confused with metacognition, in that metacognition should demonstrate an appreciation that this may have unfair consequences and lead to a modification in lines of argument as a consequence. Fairness was evident in some multiplist epistemological responses, particularly when metacognitive processes were explicit.

8.5.9 *Adequacy :*

Absolutist responses are characteristically inadequate for purpose because of their incapability to reflect the possible complexity of the issues in question. From the absolutist's perspective, however, given the methodological instruction to reason until they felt satisfied that they had addressed the question adequately, one can infer that they believed their responses were adequate.

8.6 Absolutist Epistemological Reasoning in relation to Contextual Ability.

Contextual ability as defined in chapter two is a fundamental constituent of the model of critical thinking and, thus, argument construction and analysis. In the absence of contextual considerations evidence, argumentative conclusions, clinical reasoning and clinical judgement are exposed to incompleteness and thus the acceptance or construction of one-sided arguments. Many of the absolutist responses were incomplete in this respect as demonstrated in previous examples, particularly those that use representative heuristics in their reasoning.

These two examples demonstrate first a decontextualised response to a question about the relationship between work and health and the second assumptions made about domicile location:

(R) "You focused on work a lot. Why do you think work is important to health?

(P) U1 "I think it's important to your psychological health"

U2 "because it was what gave him his reason for being who he was"

U3 "his role in life was to- or seemed to be to provide money for his children and family"

U4 " now he hasn't got that role anymore it was his complete reason for being." (Participant 7, Phase 3, Q. 4).

(R) You focused on the idea that he lived on a council estate. Would that be significant in any way?

(P) U1 "Only in terms of it gives you some sort of idea - of the kind of lifestyle"

U2 "or the kind of work - he probably did"

U3 " er - money coming in - that sort of thing"

U4 "an general health in - in health really"

U5 "it would give you an idea of his social status - I suppose - you would have to say - since the two go together - I'm saying to some extent" (Participant 30, phase 3, Q.2).

The first response reflects a one-sided argument based upon the assumption that Billy actually feels this way about his work and its fundamental role in his persona and perspective on life. There was no explicit evidence of this in the simulation and therefore the response appears to be founded upon external knowledge structures utilised in a decontextualised representative heuristic process. The response is further decontextualised, in that it only focuses upon psychological health and no

consideration is given to contexts where work or changed working circumstances may actually be detrimental to individual or family health.

The second response also demonstrates that the numerous potential alternative contextual circumstances that would contrast to the stereotypical relationship between living on a council estate and type of occupation, income levels and health status are not considered. Reasoning that is devoid of such contextual contingencies is perforce incomplete and biased for the reasons given by Bower (1993). Such an omission can have significant implications for the quality of critical thinking and professional judgement.

In summary, this section has discussed the results in relation to the majority of the sample's naturalistic reasoning mode and the tendency towards reasoning from an absolutist epistemology. Reasoning of this nature has been discussed in relation to the study's model of critical thinking with reference to the appropriate literature. Evidence is presented of specific instances of participant reasoning that represents absolutist epistemological reasoning and how it contrasts with the characteristic affective dispositions, the cognitive skills, intellectual standards and contextual ability inherent in that model. The next section will discuss instances where more complex argument structures were used in participant responses.

8.7 Research Question Three.

Of the twelve longitudinal case studies only one demonstrated a qualitative change in their naturalistic reasoning mode over the course of the Common Foundation Programme (Participant 30). This participant demonstrated a change in naturalistic reasoning mode from an absolutist epistemology to a potential multiplist epistemology. In this case, there remained numerous instances of absolutist

epistemological reasoning, but the instances of the higher category exceeded these and, thus, led to a qualitative change in reasoning mode.

The categorical criteria for the qualitative change of mode are inherent in the argument complexity scale. In the case of a potential multiplist epistemology the participant provides evidence of the generation of alternative theories. The alternatives are not, however, pursued and the participant ignores the line of inquiry or evidence that the alternative may illuminate, in favour of a return to their prior theoretical structure. The multiplist epistemological category, however, involves a demonstration of the ability to generate alternative theories and avoid the distortion or integration of the alternative into the prior structure thus leaving the response open-ended and uncertain.

Reasoning assigned to these categories would by its nature involve the use of characteristic affective dispositions, cognitive skills, intellectual standards and contextual ability to a greater degree than to the absolutist epistemological category. For example, in the case of a potential multiplist epistemology the generation of an alternative would theoretically involve a degree of scepticism towards evidence as presented following an analysis of the situation, a degree of resistance to early closure, a desire to search for independent evidence and the ability to generate an alternative theory based on the new evidence. These strategies may be as a result of metacognitive processes that lead the individual to monitor and question their view of the evidence or their approach to their reasoning. The disposition to pursue the issue further (inquisitiveness) and utilise more dispositions, skills and contextual ability to meet the intellectual standards, however, would conclude at this point, thus bringing the reasoning episode to a close in favour of a one-sided argument.

With regard to a multiplist epistemology the nature of the reasoning would include the above strategies and constituents but be extended to include a greater

inquisitiveness in the form of a desire to pursue the issue at hand further. This may be as a result of higher levels of self-confidence in reasoning ability and metacognitive processes, but would also demonstrate an open-mindedness, flexibility and tolerance of ambiguity in order to resist both early closure and the integration of reasoning elements into a one-sided argument. By nature, this approach to reasoning would include a greater degree of contextual ability and thus more adequately meet the intellectual standards integral to critical reasoning.

With regard to the one case of qualitative change and the general variance of within-case complexity of responses, the possible explanations for this are conceived of as being extremely complex and could involve psychological, social, environmental, curricular and methodological issues. An important observation however, illuminated by the methods employed in the study, is that, in instances where responses were assigned to categories above the absolutist epistemological category there was greater evidence of metacognitive processes explicit in the participants' verbal reports. Metacognition as defined in the critical thinking model requires that individuals not only monitor their thinking but also modify their reasoning as a result of this.

There were many examples of how participants would recognise possible flaws in how they were thinking such as:

> (P) U7 "So you can't really generalise - it would give me clues - to the kind of lifestyle that he may probably - but it would perhaps be in danger of being an assumption." (Participant. 30, phase 3, Q.2).

The above extract clearly demonstrates that the participant recognises the dangers of generalising from insufficient evidence and that any conclusions drawn as a consequence of such a generalisation would be based upon an assumption that the clues referred to may not reflect reality. However, the above example does not lead

the participant to modify their previous theory. The participant overlooks the possible consequences of their metacognitive utterances and returns to a prior structure regardless of these as follows:

(P) U8 "but that to me would be significant that he lived on a council estate - it would tell me quite a lot about him before I even met him." (Participant 30, Phase 3, Q.2).

The above extract clearly demonstrates that although the participant was aware of the potential for making erroneous inferences this did not lead to a modification of the prevailing theory.

Instances of metacognition that did lead to a modification in argument ultimately led to more complex arguments and thus assignment to a higher category. The following example includes extracts from a multiplist epistemological response as follows:

(R) "You said he wasn't very animated why would that be significant?"

(P) U1 "Well perhaps because - erm - it's just sort of me - this sort of idea that usually when you're communicating with someone- perhaps because it's something I do that the whole lot goes - that - as well as talking to someone - usually when you're speaking there's a lot of other - sort of body language going on."

(*S.C.)

(P) U7 "Unless he was being very controlled in - in his actions - he was either being very controlled in that he didn't want to give anything away - an he was trying to keep very - on top of everything."

U8 "Or on the other hand - he was just y'know - he was just past it."

U9 " I can't quite decide what it is - but I was conscious of that he was remarkably still - for what reason - I don't know - I would have to think about why - why he was." (Participant 30, phase 3, Q.7).

The above example suggests that the participants metacognitive insights into their own behaviour and assumptions led the participant to question whether that was generalisable to Billy's behaviour. This subsequently led to various alternative theory structures and ultimate uncertainty and an open-ended response.

Another example also includes extracts from a multiplist epistemological response for participant 37, phase 3, Test for Adequacy (TFA).

(P) ..."U4 "his daily pattern exactly"

U5 "what he exactly does eat"

U6 "how much he really does drink"

U7 "what type of drinks he drinks - I mean he says he drinks - pints but I suppose at the end of the day it could have been low - alcohol lager - or diet pop"

U8 "y'know it was just an inference that was made- that it was pints of alcohol." (Participant 37, phase 3, TFA).

Once again, the participant recognises the potential flaws or assumptions in their reasoning and this contributes to a change in argument structure that ultimately reflects a more complex argument and thus categorisation to a multiplist epistemology.

The influence of metacognition upon the quality of reasoning could, thus, be important and have possible implications for curriculum development in nursing, teaching and learning strategies, assessment processes and ultimately clinical practice. The evidence provided by phases two and three of this study suggests that absolutist epistemological reasoning is commonplace following the Common Foundation Programme and that reasoning of this nature is largely founded upon existing knowledge structures, values, belief systems and reasoning strategies that appear impervious to the volume, character or validity of evidence. Evidence also suggests that metacognitive processes may be instrumental in the development of

more complex arguments and, thus, enable individuals to avoid the indiscriminate acceptance, construction and defence of one-sided arguments as portrayed in absolutist reasoning.

The literature pertaining to the influence that metacognition has upon human reasoning tends to reflect the view that metacognition is fundamental to the development of thinking skills. Moreover, it is necessary to be conscious of the processes and products of individual's thoughts, so that such awareness can control and execute thinking to overcome the powerful influences of personal perception, values and beliefs so integral to human nature (Flavell, 1978; Halpern, 1989; Kuhn, 1991; Swartz, 1991; Fountain & Fusco, 1991; Alfaro-LeFevre, 1995; Fonteyn & Cahill, 1998).

Flavell (1978) stresses that the issue of control has three important elements in the form of: knowledge of the person (self) knowledge of the task and knowledge of strategy or process. Knowledge of the self essentially involves an awareness of individual values and belief systems and awareness of the need to control for these in relation to a commitment to reason about issues. This also involves the control of people's attention level and personal attitudes towards the issue at hand. Knowledge of the task refers as aforementioned to the influence of domain knowledge upon the task in question. Knowledge of this type according to Paris et al. (1983) incorporates: declarative, procedural and conditional (contextual) knowledge.

With regard to knowledge of strategy this involves the regulation and evaluation of knowledge, evidence, thinking strategies and would resemble the composite implementation of the fourfold components of the study's model of critical thinking whilst engaged on a reasoning task. A possible question for future research would, thus, be: to what extent would the teaching of metacognition and argument analysis affect students' critical thinking abilities?

An issue worthy of further consideration in relation to the quality of participants' reasoning in the context of methods employed by the study is the absence of accountability and practice related stress and how this might affect the outcome of reasoning. There is evidence to suggest that individual reasoning strategies are affected by the degree to which one may be held accountable for their decisions (Tetlock, 1980; Einhorn & Hogarth, 1981; Tetlock, 1983). Participants virtually never expect to have to account for decisions taken in research settings. The question, thus, arises as to whether participants would put more intellectual effort into making judgements about which they would be, or, feel more personally accountable. Moreover, the participants in this study were making judgements in the safety and comfort of a psychological laboratory and not exposed to the multitude of competing demands upon their attention and affective processes that the normal clinical environment can have. Thus, given the within-sample naturalistic reasoning mode evident whilst reasoning in the above secure setting, it would not be unreasonable to suggest that similar approaches to participant reasoning may be perpetuated in the complex clinical arena.

In summary, this section has evaluated the results in relation to research question three and the possible relationship between explicit verbal evidence of metacognitive processes and the sample's performance in the construction of more complex arguments reflective of potential multiplist or multiplist epistemologies. The elements of metacognitive processes as identified are congruent with components of the model of critical thinking developed as a framework for analysis of the qualitative data and a combination of these may serve as a basis for future research and curriculum development in programmes of nurse education.

8.8 The Contribution of More Recent Critical Thinking Nursing Literature.

Relevant empirical papers examining the issue of critical thinking as an outcome of nursing education or in relation to clinical practice are included in this review, theoretical papers and works examining disciplinary perceptions of the construct are excluded. The above literature has been categorised as follows:

- The use of simulation in the assessment of nurses' critical thinking abilities;
- The relationship between critical thinking disposition and competent clinical judgement;
- The effect of specific educational interventions upon nurses' critical thinking abilities;
- The relationship between critical thinking and professional nursing competence;
- Studies using qualitative data sources for the investigation of critical thinking in nursing;
- Critical thinking as an outcome of nursing education.

8.8.1 *The use of simulation in the assessment of nurse' critical thinking ability.*

Johannsson & Wertenberger (1996) evaluated the critical thinking ability of final term diploma nursing students in the areas of clinical decision-making, problem-solving, priority setting, and care planning, using a series of methods encompassed in the critical thinking component of the Performance Based Development System (PBDS). The system is a sophisticated performance assessment methodology developed in 1985 by nine acute American hospitals in conjunction with Baxter Management Services and uses simulations to test critical thinking ability (del Bueno, 1990; Johannsson & Wertenberger, 1996). A convenience sample (n = 18) viewed a

series of video-taped medical and surgical vignettes. These were between 2-4 minutes long and represented a continuum of task complexity and difficulty including a diverse range of client situations and problems assigned to overt or covert categories. The tasks inherent in the simulations assess learners ability to: identify problems; describe acceptable and effective nursing interventions; and provide rationale for actions. Participant responses were compared to model responses and rated as: acceptable; partially acceptable; or unacceptable. It is not made clear, however, whether responses that did not concur with the model or right responses could be viewed as possible alternatives from a critical, creative or innovative perspective. Results for the three identified categories were:

Problem recognition

- Students were more likely to identify correct problem labels for overt video simulations
- Students were more successful with problems classified as 'easy'

Prioritising Nursing Intervention

- Students were less likely to be correct in prioritising interventions than in prioritising problems;

Supporting Rationale

- The majority of students provided an acceptable rationale
- The most common reasons for less than acceptable ratings were vague rationale or rationale omitted in favour of subject perceived missing or additional interventions
- The urgency of situations were correctly identified by 60% of subjects.

The authors concluded that this aspect of the study demonstrated a consistent difference between the ability to recognise problems and knowing how to deal with them. Their concern was compounded by the relative urgency of the particular situations.

In addition, data from the simulations were compared with data from a pencil and paper "what if' test. The test comprised 15 events that required nursing interventions within an hour. Scores from the test revealed that:

- 80% of subjects correctly rated the priority for events.
- In most cases of a less than acceptable priority rating 75% of subjects overestimated the urgency of situations.
- Subjects were less successful in identifying acceptable interventions in 'urgent' or 'must do' events (31%).
- In the cases of less than acceptable ratings the most common reasons were for incomplete assessments and omission of vital interventions.

These data sets revealed similarities, in that most subjects were rated partially acceptable for their nursing interventions, followed by those rating acceptable, and finally unacceptable. Subjects stated that they had difficulty identifying the most important nursing interventions, a point which should be of concern given the subjects' apparent proximity to professional registration. An important methodological issue is that during de-briefing interviews subjects commented on their propensity to not record nursing interventions which they thought too straightforward to mention. This would have implications for the rater's subjective assessment of performance rating. The authors however express confidence in the tool's construct validity by citing del Bueno's (1990) claim that the method is more likely to err on the side of failing a subject with the desired or expected ability than to pass a subject without the ability.

Regarding the method's ability to assess critical thinking, it is questionable whether the right or wrong answer approach inherent in the simulations provides the right medium in which to detect this ability, given that a fundamental canon of critical thinking theory is the generation of alternative perspectives or theories. The right or wrong answer approach in this context may be more capable of illuminating heuristic diagnostic pattern matching behaviour as opposed to critical evaluation of the

simulated events. The method would conceivably require the utilisation of a number of critical thinking skills and dispositions as defined in chapter two, e.g. selective attention, interpretation, analysis, inference, scepticism inquisitiveness, but may not be sensitive to appreciating the generation of alternatives, fair-mindedness, and contextual ability. In respect of this, however, the authors identify the potential for the instrument to be punitive to subjects who demonstrate creativity and offer innovative, but arational diagnoses and interventions. For these reasons the authors suggest that the PBDS may not be the ideal tool for assessing critical thinking, but would serve as a useful teaching instrument.

8.8.2 *The Relationship Between Critical Thinking or Critical Thinking Disposition and Competent Clinical Judgement.*

Maynard (1996) decided to investigate the possible relationship of critical thinking to professional nursing competence. The study's conceptual framework incorporated Benner's (1984) stages of nurses' skill acquisition. Other instruments included the WGCTA and the Six Dimension Scale of Nursing Performance (Schirwian, 1978). A randomly selected, cross-sectional sample of nursing graduates was used (n=121). Two cohorts of the sample group were measured longitudinally for critical thinking ability (n=30), relationships between the measures of critical thinking and the professional competencies of leadership, critical care, teaching and collaboration, planning and evaluation, interpersonal communication, and professional development (Schwirian, 1981). Critical thinking was measured over time from neophyte student to registered practitioner (5yrs). The authors concluded that no relationship was demonstrated between critical thinking ability and professional competence, and nurses appeared to gain competence independently of their critical thinking ability. The experiential component, i.e. years of experience of nursing practice, emerged as the most important influencing factor on the development of professional nursing competence and critical thinking.

Facione, Facione & Sanchez (1994) utilised the data profiles of two nursing students derived from the California Critical Thinking Disposition Inventory (CCTDI), as a means of inferring clinical judgement abilities. Developed by Facione & Facione (1992) the instrument is claimed to be the first designed to measure the following aspects of critical thinking disposition exclusively (Table 8.8.2.1):

Table 8.8.2.1. Faciones' Critical Thinking Dispositions.

Truth-seeking

Open-mindedness

Analyticity

Systematicity

Critical thinking self-confidence

Inquisitiveness

Maturity

The dispositional subscales were derived from the Delphi Report's conceptual definition of critical thinking by the American Philosophical Association (1990) , plus item and factor analysis techniques.

Facione, Facione, & Sanchez (1994) used the CCTDI score profiles of the two nursing students to infer critical thinking deficiencies, and the potential effect of this on their clinical judgement. One example is that of one of the subjects, who having scored low on truth - seeking, critical thinking self - confidence and maturity would have difficulty in deciding between points of view and be unable to determine when it would be necessary to close an issue. Inferences such as these are problematic in that although the critical thinking subscales have empirical bases, they are still not domain specific and may not be universally transferable to the complexity of clinical judgements. The above example would not apply to an individual who had scored low on the argument complexity scale used in the current study, in that an absolutist epistemologist would not be in a position to choose between points of view and would not have difficulty in closing an issue.

8.8.3 *The Effect of Specific Educational Interventions Upon Critical Thinking Ability.*

Girot (1995) used an evaluative quasi-experimental approach to explore the perceived development of critical thinking skills within two groups of post registration nursing students. Both groups were accessing a teaching and assessing in clinical practice module by differing routes. One by means of the third year of a BSc (Hons) in Nursing route (control group, n = 15) and the other via a "Study Skills" programme designed for individuals not previously exposed to academic study (n = 25). Quantitative and qualitative data were collected using a semi-structured questionnaire and subjected to content analytic techniques. Examination of emergent themes was conducted in relation to the study's literature review. Girot's findings are presented as follows:

1. 72% of the intervention group associated critical thinking with the ability to analyse written text.

2. 28% of the intervention group and 100% of the control group viewed critical thinking as being directly related to their own clinical practice, as opposed to achieving success in theoretical assignments.

3. Each subject within the control group was confident that they had developed in their ability to think critically. This was characterised by abilities to question their own thought, decisions and practice, as well as that of others, to think laterally and be more receptive of new ideas, express and support their ideas more confidently. This increased breadth and depth of thought resulted in more flexible and less ritualistic practice.

4. Subjects in the intervention group generally felt underconfident in their ability to think critically. This, they attributed to an unawareness of the level of academic ability expected of them and that the intervention course was not long enough to develop the abilities required.

5. In relation to teaching and assessing strategies, all subjects believed that exposure to discussion and debate was necessary to develop critical thinking. Similarly, all subjects believed that teacher input should be high at the beginning of the course and reduce gradually as the course progresses.

In light of the negative perceptions of the intervention group Girot contends that the separation of study skills from domain specific content may be a significant contributory factor. She, thus, recommends that study skills programmes be linked with domain content, teachers be more aware of teaching and learning strategies that stimulate critical thinking, and innovative assessment tools be developed in order to measure success in nurse's critical thinking. Although Girot recognises the limitations regarding the study's convenience sample, she does not make clear her definition of critical thinking, its constituents or whether the control group's characteristic abilities are congruent with this . Accepting subject perceptions of personal critical thinking abilities without clear construct criteria would, therefore, be problematic regarding validity, consistency and possibly fidelity. One finding of particular interest is the control group's overwhelming consensus that critical thinking is directly related to their practice, this raises the question whether it is, therefore, discernible in their practice?

Martin (1996) attempted to assess student nurses' critical thinking performance in their written work using a qualitative action research approach. A model of two

research cycles each represented by a post registration ENB course (ENB 998: ENB941), incorporated three staged elements in the form of:

Specific sessions on critical thinking;

Use of problem solving teaching strategies throughout the courses;

Regular tutorials to monitor and facilitate progress.

The data analytic framework consisted of three critical thinking criteria namely:

Reflective Scepticism.

Identifying and challenging assumptions.

Imagining and exploring alternatives.

These derived from the work of: Brookfield (1987); Watson & Glaser (1964) and Miller (1992). During Cycle 1 (ENB 998) Martin found that students had difficulty in analysing practice, although some alternatives were discussed. As the cycle progressed a session on critical thinking with subsequent feedback sessions enabled the students to demonstrate critical analysis in the classroom setting in relation to the above criteria. However, the submitted assignments revealed a 'falling off' of analytic skills in comparison to performances in tutorials and classroom sessions. Martin suggests, in relation to this cycle, that when the formal sessions and tutorial support had concluded the students appeared to forget or ignore their critical thinking processes.

Cycle 2 (ENB 941) commenced with another formal session on critical thinking, albeit this time the content directly related to project writing and tutorials were arranged on a more regular basis in an attempt to avoid the 'falling off' of critical thinking processes demonstrated by cycle one. This time 50% of students versus 25% in cycle one were able to demonstrate more consistent critical thinking performances.

Martin concludes that while students are supported in tutorial sessions to engage in critical analysis, some improvements can be seen in relation to the three identified

criteria. This is, however, patchy and few students demonstrate consistency in maintaining this in their written work.

Perciful & Nester (1996) conducted a quasi-experimental study to determine the effect of the integration of Ausubel's Assimilation Theory, within the nursing process, in clinical teaching strategies for psychiatric nursing student's knowledge and critical thinking skills. Two hypotheses were tested at the 0.05 level of significance as follows:

1. Nursing students in the comparison group will obtain significantly higher scores for the measurement of knowledge of psychiatric nursing content than those of the students in the control group;
2. Nursing students in the comparison group will obtain significantly higher scores for the measurement of critical thinking skills than those of the students in the control group.

A convenience sample (N=83) was divided into a control group and a comparison group. The control group received traditional teaching methods and clinical experiences during a seven week clinical placement. The comparison group received an alternative programme that included a member of staff as a preceptor and a series of computer assisted instruction (CAI) programmes. Student knowledge was measured using two standardised tests: the Mosby Assess Test and two parts of the National League for Nursing's (NLN) Psychiatric Mental Health Nursing Exam. Critical thinking skills were measured indirectly using another two parts of the NLN Psychiatric Nursing Exam that focuses upon assessment, analysing and evaluation.

Results indicated that hypothesis one could not be supported. No significant differences (t-test) were found in knowledge between groups across all measures. Hypothesis two was, however, supported, in that significant t-test differences were found for critical thinking skills ($p<.025$). The authors concluded that CAI programmes can foster critical thinking skills and that the availability of a preceptor

may also be an important element in this. Limitations in relation to sample size instrumentation and the use of a single institution are noted and the authors suggest that the use of more qualitative methods may provide more accurate insights into the process of critical thinking.

Haffer & Raingruber (1998) used a phenomenological approach to discover student nurses' experiences of clinical reasoning and critical thinking development following participation in a clinical reasoning course. A narrative approach using observation of student reasoning performance during classroom sessions and students' written logs were chosen to allow holistic access to students' understanding. This was based on the belief that clinical reasoning and critical thinking are not solely cognitive entities, but are also grounded in practice and have affective elements.

Data analysis involved the researchers visiting and revisiting the texts independently to identify themes, exemplars and paradigm cases. Themes were compared and the most significant agreed upon. When wording of themes differed the text was revisited to try to find in vivo codes for narrative themes. The researchers then agreed upon exemplars and paradigm cases that exemplified the complexities of the themes.

Haffer & Raingruber reported that the purpose of the study had been achieved in that a greater understanding of student experiences of clinical reasoning and critical thinking emerged. The importance of confidence in reasoning abilities emerged as the most significant aspect of the reasoning processes. Student perceptions of threats to confidence and means of building confidence provided pedagogic insights for future development. Over the course of the programme students moved, for example, from being overwhelmed by inexperience through to drawing strength from others' experiences to becoming organised and focused in reasoning under stress. They also moved from lacking the confidence to question to discover the power in questioning.

The researchers report that confidence in reasoning and critical thinking emerged as a result of this intervention and was not consciously taught. Moreover, the development of confidence cannot be seen as separate from the growth in reasoning performance found in the study because confidence and experience are inextricably linked and derive from the authentic grasp of situations. An essential part of learning to become a nurse according to Haffer and Raingruber, is by enabling students to understand what it means to be a nurse through interactions with others within the profession. Confidence and self-understanding evolve from such interactions and students are thus empowered to ask questions. Finally the researchers suggest that confidence and therefore clinical reasoning and critical thinking can be nurtured by not asking students what they know, but by asking what they feel they need to know and how they might find answers.

8.8.4 *The Relationship Between Critical Thinking and Professional Nursing Competence.*

May et al. (1999) aimed to test the relationship between critical thinking and nursing competence because of their espoused interdependence. The study utilised a descriptive non-experimental case study design with an heterogeneous sample (2 nursing student groups n=143). The instruments used were the California Critical Thinking Skills Test (CCTST), the California Critical Thinking Disposition Inventory (CCTDI) and a locally developed standardised clinical competency evaluation tool encompassing a Likert scale of 0-4 (0 = never achieving competency - 4 always achieving competency). The latter instrument was scored by students, clinical instructors and preceptors. The study aims were:

- To describe the results of the CCTST and CCTDI measures with this population.
- To describe the results of the clinical competency measure.

- To discover the relationship between critical thinking and clinical competence

Results for aim one, demonstrated that the mean total score on the CCTDI for the group was 311 which is above the established mean score of 304 (Facione & Facione, 1994) and 93% of students achieved the cut-off point of 40 for at least of the seven subscales. Results for the CCTST revealed a group mean score of 16.37 which is above the established mean of 15.89.

Results for the clinical competence evaluation instrument revealed that all students had met the minimum pass score of 2.5 and that students consistently scored themselves higher than the clinical instructors and preceptors had.

With regard to aim three, no statistically significant relationships were found between clinical competency and the critical thinking tests scores.

May et al. (1999) concluded that the study had failed to establish a correlation between critical thinking and clinical competence. They found, however, that the CCTST and the CCTDI provided useful quantitative information regarding the critical thinking abilities of senior students and the effectiveness of the nursing programme in this respect. The authors also suggest that intuitively it would seem that critical thinking and clinical competency are related and the fact that this study had not found a correlation, may be due to the instrument's inability to capture this relationship. Moreover, they suggest that triangulated research designs that include both quantitative and qualitative data may provide more meaningful contexts to the numbers.

8.8.5 *Studies Using Qualitative Data Sources for the Investigation of Critical Thinking in Nursing:*

Sedlak (1997, p.12) used a qualitative case study approach to describe seven female baccalaureate nursing students' reflection and critical thinking processes during the first year of their programme. Critical thinking was defined as: " ...a reasoning process in which the nursing student reflects on the ideas, actions and decisions of oneself and others related to clinical experiences." Paul's (1993) critical thinking dimensions served as the theoretical framework for the study. Data sources included: journals of weekly reflective accounts of their clinical experiences; three 30-minute audiotaped structured interviews at the beginning, middle and end of the programme;non-participatory observation of 2 hour clinical laboratory sessions during which learners practise clinical skills and participated in group discussions.

Data analysis included coding and thematic development techniques derived from the works of a variety of qualitative analytic frameworks, e.g. Miles & Huberman (1994) and Merriam (1988). The qualitative data were coded into reflective, cognitive and psychomotor categories and critical thinking dimensions. The findings were subsumed under an organising theme of perspective development. Within this, four major themes reflecting the learner's development in critical thinking were identified in relation to their clinical decisions, as follows:

1. Development of the professional self-perspective with orchestration of the emotional self;
2. Development of a perfectionist perspective;
3. Development of a caring perspective;
4. Development of a self directed learning perspective.

Many of the situations reported by the learners were often more descriptive than critical, in that there was little evidence of the generation of alternative arguments of perspectives and more a reporting of the feeling and emotions experienced. Although

it is difficult to discern from the paper how data were coded to Paul's critical thinking dimensions, the data does reveal instances where learners begin to think critically. Examples of this are in regard to the learners becoming aware of the complexity of patient problems, when they realise that there are very few right or wrong answers. Other dimensions evident in the data were the development of intellectual humility (awareness of mistakes) and identification of the limitations of their thinking brought about by stress, inexperience and lack of confidence.

The author concludes that the descriptive nature of the study has been instrumental in revealing the extent of learner's critical thinking in the early components of their professional education, and facilitated insights, that standardised instruments such as the WGCTA would not provide. The key elements in ensuring that students develop critical thinking skill are reported as: early and prolonged interaction with senior students and clinical preceptors; a dialogic approach to learning in the clinical environment and stress reduction processes in the early clinical experiences.

8.8.6 *Studies Relating to Critical Thinking as an Outcome of Nursing Education.* Behrens (1996) used the WGCTA to assess the academic performance of traditional and non-traditional (>23yrs of age) nursing diploma students in the USA. Academic performance was measured by Grade Point Average (GPA). A pretest - posttest design using a sample of 109 students involved WGCTA testing over a time period of five semesters. A Pearson correlation of greater significance between WGCTA raw score and GPA was reported at the pretest phase for traditional diploma students than for non-traditional students. Pretest results also demonstrated a positive relationship between chronological age and WGCTA and GPA scores. At post-test, however, the mean WGCTA score differences were not significant demonstrating that scores had not increased as a result of the nursing curriculum.

Behrens concluded that caution must be exercised in relating WGCTA performance to long range outcomes. He also postulates that the nursing curriculum may not significantly affect critical thinking skills as measured by the WGCTA and that it is doubtful that a single measure can be found that will appropriately measure the performance of programme outcomes that involve many cognitive skills, attitudes and knowledge.

Adams, Stover, & Whitlow (1999) conducted a longitudinal study between the sophomore and senior years of a baccalaureate nursing programme in the USA (n=203). The WGCTA (1980) forms A & b were used as the measure of critical thinking ability. Additional variables were also included for evidence of correlation these included: American College Test Scores (ACT); Grade Point Average (GPA); and age. Further nominal variables were also examined and these included gender and whether participants were undergraduates or postgraduates.

The pre and post test WGCTA scores showed no change from sophomore year to senior year. A paired sample t-test also showed no significant statistical difference. There were no significant differences found in the overall subtest scores. Although a moderate positive correlation was found between WGCTA scores and ACT scores, a weak positive correlation was found between Sophomore and Senior WGCTA raw scores and GPA. No significant relationship, however, was found between WGCTA raw scores and age.

Adams et al. (1999) concluded that the WGCTA is not the instrument of choice for longitudinal measurement of critical thinking ability in baccalaureate nursing programmes. They advocated that nurse educators should investigate the use of other quantitative instruments and develop qualitative methods for the measurement of critical thinking in nursing.

McCarthy et al. (1999) also used a longitudinal study to evaluate the development of critical thinking ability in an American baccalaureate nursing programme. The California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Disposition Test (CCTDI) were used to address the following questions:

- Are there differences between sophomore and senior students on total scores of the CCTST?
- Are there differences between sophomore and senior students on total scores of the CCTDI and the subscales of the CCTDI?
- Is there a relationship between the CCTST and the CCTDI?

The Cross-sectional design comprised a sample of 241 nursing students of which 156 were sophomores and 85 were seniors. Both groups demonstrated similar pre programme mean Grade Point Averages and American College Test Scores. The Sophomore group comprised 43 males and the senior group 18 males. Form A of the CCTST was used for pre and post tests which were twelve months apart.

Results for question one demonstrated a significant difference between sophomore and senior score on the CCTST.

For question two scores on the CCTDI showed that seniors scored significantly higher than sophomores on the total scores and on four of the subscale scores, i.e. truth-seeking, self-confidence, analyticity and inquisitiveness. There were no significant differences in the subscales of open-mindedness, systematicity or cognitive maturity.

Results relating to question three demonstrated a weak correlation coefficient between the two measures.

McCarthy et al. concluded that the cross-sectional design may have produced results that were an outcome of cohort differences as opposed to differences related to the passage of time. The results overall supported the previous findings of Berger (1984) and Gross et al. (1987), although correlation between the CCTST and the CCDTI was lower than that reported by Facione, Facione and Sanchez (1994). The authors further concluded that future research is needed to explore the relationships between critical thinking skill, critical thinking dispositions and curriculum characteristics.

The above empirical nursing literature review maintains the inconclusive nature of the body of evidence relating to the development of critical thinking as an outcome of nursing education. This latter group of studies encompass a range of sample sizes and methodological diversity. However, the situation remains complex and unclear, while some individual studies provide supporting evidence for the effect of nursing education on the development of critical thinking ability others do not. It would appear that, with the exception of McCarthy et al, Girot's control group and the qualitative studies of Haffer & Raingruber and Sedlak, most studies had negative outcomes in terms of critical thinking skill development. More recent studies (May et al. 1999; McCarthy et al. 1999) reflect the growing popularity with the CCTST and the CCTDI over the WGCTA. These tools tend to also reflect more positive outcomes for nursing education. The issue of the relationship between critical thinking and clinical competency remains, as yet, unanswered. This trend in evidence is in keeping with the findings of this particular study although no other study has investigated the construct in the way this study has. Furthermore, no other study appears to place argumentation and the development of more or less complex arguments at the centre of definitions of critical thinking despite their prominence in the literature.

8.9 Summary

In Summary, this chapter has evaluated the study findings in relation to the research questions posed and the definition of critical thinking proposed. The qualitative data and research literature have been discussed to elucidate and evaluate the issues arising from the data. As with other studies investigating critical thinking in nursing education, the data produced in this study suggests that a significant component of the nursing curriculum does not appear to have realised the aim of developing uniform critical thinking abilities in a group of student nurses. The WGCTA scores in this instance have not proved to be useful predictors of student performance in terms of success in the programme as a whole, given that the majority of learners went on to qualify. The unchanging level of mean scores identified in phases one and two, however, are congruent with the unchanging level of group naturalistic reasoning mode for phases two and three. The triangulation of methods has, thus, made a useful contribution in providing a degree of completeness to the examination of critical thinking.

The body of evidence relating to this phenomenon, thus, remains inconclusive. The data produced has been useful, however, in providing insights into the actual concurrent professional reasoning strategies of the group of nurses and will serve as a basis for the consideration of educational strategies to address these issues.

The educational task remains a complex one. The evidence generated in this study further demonstrates that the epistemologies underpinning participants' everyday reasoning strategies are powerful and appear unrelated to educational processes (course content) and volume of evidence (focal universe). The absence of explicit reference to formal theories in participant protocols suggests that the sample's reasoning may still be based upon individual internal knowledge and belief structures at least to this point in the programme. Differing constituent complexity in terms of

the focal universes generated by participants has also been shown to have little relation to the naturalistic reasoning mode of this sample.

CHAPTER NINE

CONCLUSION AND RECOMMENDATIONS

9.0 Introduction.

The purpose of this chapter is to draw together the various elements of the study and draw conclusions in relation to the original aims and make recommendations in light of these for the curriculum and future research. To achieve this the chapter will review the following:

- The purpose of the study and its contribution to the body of knowledge.
- Methodological issues and contribution to the field.
- Implications of the findings in relation to nursing practice.
- Implications of the findings in relation to curriculum development.
- Limitations of the study.
- Recommendations and suggestions for future research.

9.1 Study Purpose and its Contribution to the Body of Knowledge.

When this study commenced in April 1993 pre-registration education had undergone a process of review and change which had culminated in the development of project 2000 pre-registration programmes. These programmes are now implemented nationally, are referred to as RN/Dip HE programmes and are validated at diploma level with institutions of higher education. The stated outcomes of the new programmes were replete with terms such as: knowledgeable doer, autonomous, critical, creative and emancipatory (UKCC, 1986). The international literature at that time espoused the virtue of critical thinking as an essential constituent of nursing practice and as an outcome of

nursing education. The purpose of this study was to examine whether the curriculum operating within the author's School of Nursing & Midwifery was achieving the discrete curricular outcome of developing critical thinking ability in student nurses during the Common Foundation Programme. Three specific research questions were, thus, formulated to address the overall purpose of the study in relation to the complex issue of critical thinking and whether it could be identified in student nurses' concurrent domain specific reasoning.

This purpose was facilitated by the development of a longitudinal across-method triangulation research design that produced comprehensive data over time relating to student performance, particularly in relation to the argumentative, contextual, and metacognitive aspects critical thinking. The findings produced are not entirely unique when compared to the overall body of evidence currently relating to critical thinking and nursing education and in the absence of specific teaching. The findings, however, have served to illuminate problems of student reasoning in relation to argument construction and analysis. This will assist teachers in future attempts to encourage more effective and complex clinical reasoning strategies. Although this study has focused upon the verbal reports of concurrent professional reasoning, the findings may also facilitate understanding and evaluation of student performance in written assignments where descriptive and simplistic arguments may also be evident.

Another important contribution arising from the study is that a deeper insight into the conceptual nature and complexity of critical thinking, and how it relates to nursing practice has been forthcoming (Daly, 1998). As the study progressed it became apparent from the literature that a consensus as to the meaning and constituency of critical thinking did not exist. The study's contribution in respect of this was that a conceptual definition with constituent elements was developed to contribute to the knowledge and

serve as a basis for subsequent evaluation. The development of the definition of critical thinking and its fourfold components clarified the role of argumentation and contextual ability within the spectrum of critical thinking which also served as a sound basis for the operational aspects of critical thinking within the study. These served as useful indices of critical thinking in the analysis of the large and rich body of qualitative data produced by the study's methodology for phases two and three.

9.2 Methodological Issues and Contribution to the Field.

As the study and the literature review progressed it became apparent that no research specifically relating to critical thinking as a specific outcome of nursing education had been conducted in the United Kingdom at that time. The body of empirical evidence was largely American and was also inconclusive. In addition to this, criticisms were emerging relating to the reliance upon standardised instruments of measurement for such a complex construct, and that the instruments were not domain specific. Calls for alternative methods of examining critical thinking in nursing were being made and these became the impetus for the development of the alternative methodological approach designed for this study.

A triangulated approach was chosen in order to utilise an existing instrument to provide a reference point for an alternative methodology. The Watson-Glaser Critical Thinking Appraisal (1991) was chosen for the reasons previously identified and provided evidence, as in other studies, that nursing education does not consistently improve scores in this test. Test scores such as these however, do not provide insights into the type of reasoning underpinning the scores achieved. The think aloud method subsequently developed for the study was designed to overcome this knowledge gap and the criticisms that previous instruments were not domain specific. The simulation approach was also

intended to overcome the criticism that written case study type instruments did not capture or provide the situated complexity reflective of nurses' judgement processes.

One of the early challenges in the study was to design and perfect the think aloud technique for data collection. This involved a prolonged iterative approach in the form of a pilot study involving ten willing volunteers from a variety of student groups. Following the development and refinement of the think aloud data collection methods, the next challenge was to secure volunteers for the study proper. This proved difficult initially. Whilst students readily consented to undertake the Watson-Glaser Critical Thinking Appraisal fewer felt able to volunteer for the think aloud phases of the research. However, with diligent and persistent explanation and gentle persuasion thirteen volunteers from an initial cohort of twenty plus were secured. One, however, was subsequently lost to maternity leave, resulting in the final sample of twelve. As with any longitudinal study this sample was prone to the danger of sample mortality, but fortunately, this sample remained stable over the various phases of the study. In terms of data production the twelve volunteers provided a large body of rich qualitative data which was sufficient for purpose.

In combination the study's methods and longitudinal design have provided evidence that achieves a degree of completeness not achieved by previous studies. The WGCTA scores are consistent with other studies that show no significant changes in score as a result of an educational programme and that demographic variables have no significant effect on test performance. The simulated think aloud task and argument complexity analytic strategy however, extends our insights as to why learners may not demonstrate changes in test performance by illuminating their contemporaneous reasoning strategies and shortcomings in respect of this. Outcomes such as this are supported by Haffer & Raingruber (1998) who argue that a need exists for nurse educators to be better

grounded in the ways that students actually reason in relation to professional issues. Without these insights they claim educators will be unable to assist in the development of clinical reasoning and critical thinking.

The illumination of the underlying epistemologies of the participants in the think aloud sample is useful for educators and students because it provides clear insights into reasoning processes. These are particularly important in relation to weaknesses in the construction of simplistic one-sided arguments, and the strengths inherent in multiplist or evaluative arguments. Such information can also serve as indices of performance in future reflective strategies or in the development of assessment criteria as in the grading scale attached at appendix 9 which is based upon the findings of this study.

As with many studies that generate qualitative data to understand and describe phenomena, the development of the analytic framework has been an arduous and iterative process that initially proved extremely vexing. The complexity of critical thinking as an entity also contributed to the difficulty of the research task and many exploratory pathways led to analytic cul de sacs. The outcome of this aspect of the study, however, is a framework that with practice can analyse argument complexity reasonably quickly and facilitates an auditable trail for qualitative analysis. The framework also provides a sound basis for the analysis of reasoning over time as was the case over phases two and three of this study.

9.3 The Implications of the Findings for Nursing Practice.

Reasoning from an absolutist epistemology may have implications for clinical practice. As stated previously, this study has not focused on issues of professional competence discretely and as the evidence presented previously suggests there appears to be no evidence that critical thinking is a pre-requisite for competent nursing practice. The

implications for nursing practice can only be inferred at this point founded upon the premise that such an epistemology endured throughout the subsequent Branch Programmes.

Reasoning from an absolutist epistemology could conceivably impoverish clinical reasoning, in that the aspects of assessment, diagnosis, implementation and evaluation of patient care and intervention may reflect the values and stereotypical frameworks of the practitioner and not take into account relevant alternative possibilities and individual contexts of the patient and family. Practitioners may fail to attend to the potential complexity of patient situations during the professional judgement process. Alternative perspectives and, therefore, alternative care frameworks and solutions may be excluded in patient responses to and management of their healthcare needs. The element of early closure characteristic of an absolutist epistemology may compound these consequences, because practitioners can be over-confident about judgements, that are based upon limited search for alternative information and possibilities (Lange et al. 1997). Such an absolutist approach to clinical reasoning would have implications for the development of reflective practice, in that practitioners may not be disposed to, or perceive themselves as capable of, the search for contradictory evidence in the evaluation of their practice. The inappropriate use of representative heuristic strategies may also result in the reasoning within stereotypical frameworks. An example of this is demonstrated by Bowler (1993) which identified the practices of midwives who did not approach female Asian patients with family planning advice because of a stereotypical perception that they would not be interested in such information. A further consequence for nursing practice, is that reasoning from an epistemology that characteristically eliminates curiosity, inquiry, questioning doubt and the consideration of alternatives could serve to maintain the status quo and the perpetuation of ritualistic practices regardless of their utility and efficacy. This would not only conflict with contemporary initiatives to foster clinical

effectiveness (NHS Executive, 1996: RCN, 1996: Oldham, 1997), but could impoverish reasoning and performance in relation to broader professional, ethical and organisational issues that extend beyond that of immediate clinical priorities amidst a climate of perpetual change. Moreover, individuals who reason from an absolutist epistemology may not be predisposed to engage with the processes of change and innovation. Hogan (1997) suggests that innovatory behaviour involves the explicit proactive search for the opportunities for productive change. In the absence of multiplist or evaluative approaches to reasoning associated with innovation however, absolutist epistemologists may reject opportunities for innovation, in favour of maintenance of the status quo. Furthermore, critical thinking and innovation are not the sole responsibility of practitioners. From a broader perspective, the organisational climate and culture must also encourage and support such practices. This to some extent presupposes that managers are also sensitive to, and equipped with, critical thinking abilities and are prepared to nurture and develop a culture that will value and appreciate such abilities. Hollaway & Penson (1987) and Wilson & Startup (1991) argued that the pressures to conform to socialisation in the practice environment are enormous. Thus, practitioners have to choose their own priorities in relation to the associated risks between passivity and critical activity in practice. Caution must also be exercised in moves towards the development and implementation of standardised procedures, guidelines and care pathways. Instruments such as these may well be welcomed by individuals with a predisposition towards absolutist reasoning because they may appear to give the illusion of generalisability and completeness for individuals not predisposed to question, doubt, or search for inconsistencies, shortcomings or alternatives. They may, thus, compound the problems of simplistic and decontextualised rote clinical judgements that do not meet the complexity of patient or client need.

9.4 Implication of Findings for Curriculum Development

The main implication for the Common Foundation Programme curriculum, is that the intended outcome for the development of critical thinking during the programme does not appear to have been achieved, at least not in the ways operationalised by this particular study, or within the time frame involved. This outcome must be viewed in light of the absence of a common institutional definition and understanding of the nature of critical thinking and in the absence of specific teaching and learning strategies in respect of the above. This may also illuminate the possibility that the host institution, and even the broader nurse education establishment, did not have clear insights into the nature of critical thinking during the design, teaching, and assessment of early project 2000 type programmes. Moreover, Adams (1999) questions that if nursing education does not teach what critical thinking is, or teach by means that stimulate critical thinking, then how will nursing students learn the skill and apply it in practice? The next logical consideration would thus be whether teaching and learning strategies that specifically focus upon the definition and implementation of critical thinking would improve the situation. Previous researchers have reported that specifically designed teaching and learning strategies can encourage critical thinking and problem solving skills (Feuerstein et al. 1980; Resnick, 1983; Glaser, 1984; Strong, 1985; Leroux, 1986; Weinstein & Mayer, 1986; Herrnstein et al. 1986; Schonfeld, 1987; Wang & Palinscar, 1989; Weaver, 1989; Dunkhase & Penrick, 1990). Teaching strategies range from courses designed to focus upon the array of discrete critical thinking skills and logical competence to problem based strategies involving debating skills and argument analysis. The former approach has been criticised on the grounds that although skills oriented courses teach skills, they may not necessarily challenge thinking. Paul (1987b) argues for example, that such courses may actually encourage sophistry by enabling students to rationalise their existing biases. Strategies involving debate and argument analysis

however, may lead to a more mature evaluative epistemology (Perry, 1970; Belenky et al. 1986; Kurfiss, 1988; Paul, 1987b; Kuhn, 1991). The problems facing nursing education, however, would be which approach to adopt, and how would such discrete or self contained programmes be incorporated into an already comprehensive and complex curriculum that has too many statutory elements? In order to overcome problems of trying to fit additional discrete modules into the existing curriculum, an alternative approach may be to try to develop an underlying critical thinking culture that pervades and underpins the teaching and learning strategies as a whole.

One way of achieving this could be to develop an institutional consensus as to the definition, value and constituent characteristics of critical thinking using this study's conception as a basis for debate. The value of critical thinking and its perceived relation to effective clinical reasoning and caring would need to be explored and established. Various studies have already demonstrated the diverse conceptions of that exist among academic institutions and staff (Jones & Brown, 1993; Videbeck, 1997; Adams, 1999).With an academic body of approximately one hundred and twenty members and many more clinical colleagues involved in the teaching and learning of student nurses, within the author's host institution, this would be an arduous and complex process. If achieved, however, such a strategy would pay dividends in the development of future academic and practice assessment based upon a common understanding and operationalisation of the construct.

In addition to a critical thinking consensus, issues identified in this study could be utilised to serve as a foundation for discussion of the development of teaching and learning strategies to stimulate and support critical thinking in the academic and clinical components of the curriculum. The study findings in relation to the naturalistic reasoning mode of the volunteer sample and the scale of argument complexity could be

disseminated to illuminate the nature of reasoning and potential shortcomings of such reasoning in relation to clinical reasoning and academic performance. The centrality of argumentation and argument analysis to critical thinking could also be illuminated with a view to fostering the development of academic assignments that would require the utilisation of the skills of argument analysis as a train of reasoning in which claims, supporting reasons and alternatives are linked to the construction of a justifiable position, diagnosis or therapeutic decision. Argument analysis would, thus, provide students and academic staff with a mutual framework for the conduct and assessment of student work that extends beyond factual and procedural correctness. This would also provide some criteria for the pervasive requirement to 'discuss', 'analyse' and 'critically appraise' phenomena, practices and issues. Teaching strategies in the classroom utilising real problems encountered in practice, could also incorporate such argumentative approaches to learning, in relation to appropriate complex issues such as ethical dilemmas, health, health promotion, cultural and spiritual aspects of care and interdisciplinary perspectives of health care. This type of approach to teaching and learning could not only help to develop the cognitive and contextual skills inherent in this study's conception of critical thinking, but may also stimulate the various characteristic dispositions to think critically if the encounters can be readily linked to patient outcomes in the practice domain.

The potential positive interrelationship between metacognitive strategies and reasoning as identified in the literature and this study's findings should also be considered in the development of teaching and learning strategies to promote critical thinking. Challenging students and colleagues to externalise their reasoning about positions and practices can facilitate greater insights into the processes, consistency, relevance, contexts and appropriateness of their reasoning. This could be achieved both in the classroom and in practice learning encounters by the use of more Socratic approaches where students and teachers are encouraged to explain the thinking behind their views and decisions. There

is some evidence to suggest that small group tutorials, one-to-one preceptorship and the appropriate use of questioning strategies during clinical teaching is important in fostering the utilisation of critical thinking skills in clinical reasoning (Martin, 1996; Perciful & Nester, 1996; Sellappah et al. 1998). Such approaches can illuminate the knowledge structures, heuristic strategies, experiences and beliefs that influence reasoning and facilitate an exploration of the accuracy, appropriateness and completeness of peoples' thinking. Metacognition can also be encouraged and developed by the use of reflective logs or dairies particularly in relation to learning in the clinical environment where time frames and workplace demands may not provide consistent opportunities for Socratic approaches to operate. Fonteyn & Cahill (1998) report that students prefer the use of clinical logs to other written forms of assessment and assert that clinical logs, maintained on a daily basis, enable students to become more active learners, manage their own thinking and improve their metacognition. Reflective dairies have recently been introduced into some areas of the institutions' curricular assessment strategies but these would need to be evaluated in respect of their capability to stimulate critical thinking and metacognition in the ways outlined above.

9.5 Limitations of the Study.

This study set out to address a complex issue and contribute to investigation of critical thinking in a nursing context by developing an alternative methodology to provide evidence of critical thinking as an educational outcome, by means other than the sole use of a standardised instrument. The study did not, thus, aim to produce findings that were necessarily generalisable to other populations at this stage in knowledge development. The body of longitudinal data upon which the findings are founded has been considerable although the generalisability of the findings may be limited by the sample size. Moreover, the fact that the simulation chosen to underpin the data collection methods represents only one of the myriad of possible professional judgement situations encountered by

students and practitioners it must be, thus, recognised that an alternative simulation, focusing on a different or more structured factually oriented situation or focus, may have produced different responses.

The study also focused only on one group and one, albeit homogenous, component of the pre registration curriculum. Student reasoning performance may have been different at the end of the heterogeneous Branch Programmes. Given the fact, however, that the sample's underlying epistemology had remained predominantly unchanged over the course of the CFP, where workplace demands and socialisation pressures would be less apparent, the maintenance of such an underlying epistemology appears feasible and indeed probable.

The study's longitudinal approach may also be an important limitation, in that critical thinking in the ways identified in the conception of critical thinking used in this study need not emerge over this length of time, or, at this stage in the students' learning. We may thus be expecting too much of our learners, too soon in the educational process. The early professional socialisation processes and the acquisition of a professional knowledge base may impinge upon learners' cognitive and affective abilities to the extent that it impacts upon the development of critical thinking abilities in their early professional development. The development of critical thinking skills may need to be viewed as a continual process that requires the elucidation of levels or stages of critical thinking development that develops as professional knowledge and experience expands.

This work does not offer a detailed model of the mental operations that student nurses execute in performing professional reasoning and judgement, as do those developed by cognitive psychologists as in other reasoning or problem-solving research. It does, however, contribute several things that are of direct relevance to the study of student

nurses' thinking skills. First, it identifies specific forms of reasoning in relation to an abstract professional issue, that are central to critical thinking, and shows how they relate to specific constituents of critical thinking. Second, it demonstrates that the forms of reasoning identified are enduring, irrespective of a period of professional education and experience, and establishes their generality within a sample. Third, it provides detailed empirical evidence regarding the structure of the various forms of reasoning in relation to the cognitive task. The information, thus, provided is important if one wishes to promote, teach and assess critical thinking through educational intervention.

Based upon the data generated from this study, the subsequent discussion and conclusions discussed above the following recommendations are made:

9.6. Recommendations for Curriculum Development and Further Research.

- An institutional statement regarding the value of critical thinking and its relationship to academic development and clinical practice should be explicit in the institution's philosophy, mission statements and programme documentation.
- An institutional consensus as to the definition and constitution of critical thinking should be developed in order to facilitate uniform teaching and learning strategies.
- Students should be made aware of the institution's definition and constitution of critical thinking and the role it plays in their academic and professional development.
- Teaching and learning strategies that incorporate and develop metacognitive processes should be investigated as a means of promoting critical thinking and reflective, innovative practice.

- Teaching and learning strategies that facilitate more Socratic small group or one-to-one preceptorship opportunities in the clinical environment, based upon real case studies and clinical problems, should be considered.
- Argument analysis as a framework for curriculum development and teaching and learning strategies should be considered as a vehicle for promoting critical thinking abilities.
- Levels of critical thinking ability commensurate with discrete stages of academic and experiential development should be considered as indicators of appropriate achievement.
- Consideration should be given as to whether teaching and strategies specifically designed to promote and assess critical thinking should be explicit in programme validation criteria.
- Further research should be conducted using a range of learners and clinical simulations to further test the generalisability of the study's methods and analytic framework.
- Further research should be conducted using a range of qualified practitioners in various settings to determine the role that clinical experience and other factors may play in the complexity of clinical reasoning strategies and reasoning outcomes.
- Further research should be conducted to examine whether the argument complexity scale could be transferred to the assessment of reasoning in written course work.
- Further research should be conducted to examine whether the argument complexity scale could be adapted and utilised as a component of the recruitment and selection process for nursing students as a predictor of success.

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Appendix 1

	Trimester 1	Trimester 2	Trimester 3	Trimester 4	Trimester 5a
Course Themes	Understanding Health	Factors Detrimental to Health	Introduction to Nursing Practice	Understanding Delivery of Health Care	Altered Health Status
Modules	- Concepts of Health - Psychology of Health - Social Construction of Health - Understanding the Human Body	- Health Promotion - Communication - Social Policy I - Health & Work Issues - Understanding the Human Body	Vocational experience - Child - Adult -Mental Health -Mental Handicap	- Understanding Nursing Practice - Social Policy II - In Sickness & in Health - Research (1) - Ethical & Legal Issues	- Biological Perspectives - Research II - Counselling - Elective

	Trimester 5b	Trimester 6	Trimester 7/8	Trimester 9
	ADULT	**BRANCH**		
COURSE THEMES	Altered Health Status	Understanding Nursing Care	Understanding the Delivery of Nursing Care (Practice)	Evaluation Management of Nursing Practice
MODULES	- Biological Perspectives - Research II - Counselling - Elective	- Assessing Care - Planning Care - Implementing Care - Understanding ill-Health	ROSTERED SERVICE	- Auditing Care - Evaluating Care - Research III - Management & Teaching
	CHILD	**BRANCH**		
	- Biological Perspectives - Research II - Counselling - Elective	- Developmental Influences - Understanding Ill-Health - Theory of Nursing Practice - Practice of Paediatric Nursing	ROSTERED SERVICE	- Trends in Paediatric Nursing - Evaluating and Auditing Care - Management and Teaching - Research II
	MENTAL HEALTH	**BRANCH**		
	- Biological Perspectives - Research II - Counselling - Elective	- Sociological Perspectives of Psychiatric Nursing - Psychological Perspectives of Psychiatric Nursing - Physiological Perspectives of Psychiatric Nursing - Perspectives of Mental Health & Illness	ROSTERED SERVICE	- Advanced Psychiatric Nursing I - Advanced Psychiatric Nursing II - Research III - Management and Teaching
	LEARNING	**DISABILITIES**	**BRANCH**	
	- Biological Perspectives - Research II - Counselling - Elective	- The Mentally Handicapped Child - The Mentally Handicapped Adult - The Multiply Handicapped - Severe and Profound Learning Difficulties	ROSTERED SERVICE	- Intervention Studies - Elderly Care - Research III - Management and Teaching

Appendix 2

Dear Colleague,

Thank you for agreeing to participate in this research programme, your personal contribution is greatly valued and will assist in the development, and refinement of the proposed methodology for data collection and subsequent analysis. The focus of the study is to investigate certain aspects of student nurses problem-solving / reasoning processes. For this reason I would like you to **'think aloud'** as you consider the material presented to you. This may seem strange initially and we will try to overcome this feeling, if applicable by using 'warm up' exercises. Some of you may already be used to 'talking to yourself' as you work through problems, (its not true what they say!).

The important thing is that you try to talk aloud constantly from the time I present the material to be considered. This should include everything that comes to mind e.g. false starts, repetitions, mistakes etc. It does not matter how irrelevant or trivial the thought might appear, I would like to hear it please. Try not to plan what to say, but let your thoughts speak as though you were really thinking out loud.

You may find yourself lapsing into silence at intervals, and in order to maintain continuity of your account I will occasionally or maybe even frequently prompt you to **"Please keep talking"** or **" Please remember to tell me what you are thinking"**. Please try not to get frustrated or concerned by this, silent thought is perfectly natural, and nothing personal is meant by the frequency of prompting. However as complete a record as possible is important. Should you have any concerns regarding this procedure please **"think them aloud to me".**

Thank you for your assistance.

Appendix 3

Consent Form

The purpose of this study is to investigate certain aspects of students nurse's reasoning/ problem solving abilities and processes, whilst engaged on a nursing orientated cognitive task . Part of the study will examine your reasoning in action, that is, as you actually work through a task.

Data collection methods are to include undertaking of a pencil and paper test lasting approximately 40 minutes in the first instance, followed at a later date by the viewing of a videotaped nursing orientated scene. During your viewing of the scene you will be requested to 'think aloud', that is ,talk about what you are thinking. This is to enable the researcher to capture precisely how you set about dealing with the task at hand. Your verbalised thoughts will then be recorded on audiotape and transcribed verbatim in order to facilitate analysis.

There are no perceived physiological or psychological hazards associated with these techniques.

Anyone volunteering to participate in this study should do so on the understanding that you are free to withdraw from the study at **any time without giving reasons, and without fear of penalty.** Similarly, **no personal benefit of any kind is to be implied or expected by your decision to participate.**

Your rights in law are to be in no way compromised by your consent to participate in the project. **All data will be confidential and used solely for research purposes.**

If these criteria meet with your approval could you please sign and date the consent form provided. Could you please explain in your own terms what you are being asked to participate in.

Consent to participate in Research.

I ..... confirm that the nature of the study overleaf, and the proposed methods of data collection have been explained to my full satisfaction, and I am in agreement with the consent criteria.

My interpretation of what I am consenting to undertake is as follows:

Signed.....

Date.....

UNIVERSITY OF WOLVERHAMPTON

ACADEMIC AFFAIRS OFFICE
COLLEGE HALL
DUDLEY CAMPUS

Appendix 4

INTERNAL MEMORANDUM

To: Steve Cavanagh

From: Heather Robinson
Research Support Unit
Extn. 3312

Date: 7 October 1993

Notification of Decision of Ethics Committee held on 1 October 1993

Ref No: EC 93/94/75

Project Title: Critical Thinking in Nursing Practice

Investigator: William Michael DALY

Ethical approval was given.

a:ethics/memo010

Appendix 5

Pilot Study Debriefing Interview Details.

Thank you for participating in this exercise. Now that the actual data collection is complete, it would be helpful if you could report your experiences of the methods used. This additional information will assist the researcher in further developing or refining the methods for future use.

Questions.

1. How did you feel prior to the commencement of the exercise?

2. What are your views on the instructions you were given?

3. How did you feel about the way the instructions were administered?

4. Could the instructions be improved in any way?

5.How did you feel about the volume and arrangement of equipment used?

6.Could this be improved in any way for you?

7. What are your views on the 'warm up' exercises? (if applicable).

8.What did you think of the quality of the case study, as presented to you?

9.How did you feel about 'thinking aloud'?

10. Could your 'thinking aloud' performance have been assisted / improved in any way?

11. Did my presence have any affect on your performance?

12. Were you conscious of any distractions / difficulties in concentrating ?

13. Do you feel you have benefitted in any way from this exercise?

14. Would you do it again?

15. Any other comments regarding this type of method, or the way in which it was conducted?

Appendix 6

Data: Phase Two

Participant 2

S. I see in front of me - er - a chap - erm - middle forties - he's in his house - er - sitting on his sofa - he's chatting about his lifestyle - how he sees it - he considers himself healthy - he is actually - he's got a Scottish accent - so - an he says he has been unemployed - an in Scotland its quite unemploy - er - high unemployment rate - he's explaining how he actually erm - goes job hunting - an er - er he's talking about holidays - quitea time ago he seems to say - he's actually talking of money - he's - he's reading a large newspaper now - can't see which the title is - theres er - trophies in the cupboard - so obviously they do some sports - well spread family - lives in a council house - right by a road - there could be traffic polution - er - obviously - he sounds like - there could be tension at home - if - if he's at home a long time - erm - explaining how he spends his day - an it is a tabloid paper - oh yeah - tch - not a tabloid - tis a large broadsheet paper - he explains - see - seems to be wanting er to keep his mind busy - actual body language - he's holding his hands - an er - sitting quite relaxed in the chair - an he's thinking things - an actually makes - he - he's actually explaining his day all in little compartments - what he does - he seems to being unemployed wants the need to erm - feel that he's doing things - explains about his wife - his wifes actually on the picture - she's smiling at the baby - so it must be quite a worry really - having children - an not having a job - his actual skin looks a little - little marked- whether thats a liitle bit - the diet they have - or worry coming out - stress - erm - he erm - he actually hasn't explained that he helps much with the children - but er - he's explaining that his wife perhaps looks after the children - not himself - so much - actually in the cupboard they're er - little miniatures of whisky bottles there - could perhaps be er - drink - it might not be er - a drinking problem -

but in Scotland sometimes people like collecting whisky - books on the side - childrens toys around quite a lot - er - he's explaing that he's at home quite a lot - so he's very - he finds it hard that - he does seem to be talking - he finds it very hard not having a job - an - he yeah - he's keeps saying difficult - an he does look quite tense actually when he's talking this way - yeah - erm - he's actually verbalizing what people do think - I think they think - at first they're full of enthusiasm - they can get a job pretty quickly - but then long term unemployed people often suffer - more from not receiving a job - getting a job straight away - an I should imagine that'd be - for me it would be seem very depressing - to - not that - he - he does like to - Billy does like to - erm - take up his time - getting definite - filling up his time - he feels he doesn't just want to sit around - or- hasn't actually said that he - goes out - an goes out a lot - spends a lot of time in the house actually doing his things - er - actually - speaking of the house - the house doesn't look untidy - it looks very neat - but er - he's expressing - that er - home decor - er - home improvements are very hard - and also (laughs) - he's talking of his motivation of - doing actual - I think - actual tasks - that he thinks are more - er - male - sort of decorating about the house - an er - golfing - an other er - work colleagues - he's actually his social life has changed - from - not - er - I suppose from a financial point of view he's actually saying - that er - socialising it could be a sport - but obviously there's more to it than that - an there's er - actual - buying of drinks afterwards - er - er - obvious - er - he's speaking of his wife - er organizing - budgeting the household - er - the household er - finances - an it must be very hard really - having no spare money - at all - an - his wife actually seems to take on quite a lot of the decisions now - because it is the house - an - an the house is traditionally - I suppose the womans point of view - she's at home making the home - an looking after the children - oh - he's spoken of what - seems to me quite heavy drinking - he's just actually explained - that er - it isn't - they don't er - consid - people who do drink a lot - an perhaps his friends (laughs) - actually mentioned the medical profession - that - they would erm - say that it is quite a lot - 14 pints - but he's sort of - er - he's sort of saying that - that isn't er - I think - its -

people like to er - make their point of view - make it seem that its right - sort of talk it round - specially drinking or smoking - its er - a social event really - an - it seems that thats what Billy's saying - socialising with his male friends - an - a male sort of thing - he's actually speaking of something engineering - thats er - his job - an he's perhaps saying there isn't so much more - manual work to - to get - he's just expressed - that he's doing computer work - an that could possibly be - er - how - er -aware that that could be a one - the job of the future - he's study - studying at home - he's got a lot of tapes an information in front of him - seems - seems like he's possibly motivated in that way - that he'd like to do that. (simulation ends)

R. Would you agree with Billy then. Is he healthy?

S. I think er - Billy didn't think himself unhealthy - but I think that erm - he obviously - erm - I think there seemed to be a little bit of strain between the wife and Billy - he's there a lot - what he actually likes to do - he doesn't mention that he helps his wife - in anything around the house - an so she appeared to have the attitude - this is what Billy! (simulates anger) - er sort of verbalised - that sort of - well a long as you're out of my way - an not doing something - then y'know - she did all the - dealt with the children - erm - anything around the house - and er - did the shopping and domestic chores - an he sort of - an he - he found that - he felt that he was keeping healthy - busying himself with erm - his own er - y;know interests - er but it didn't seem to er - actually - whether - I don't know - he didn't seem to actually get out much an exercise - but we only saw him in the living room - so we can't really - I mean thats a quick judgement - erm - an he seemed very much into himself - er - obviously you have - you not socialising - you not going out at work - mixing with your mates - having the money to socialise afterwards also - erm - when you're in the house - I think you must - must become - more sort of - er - isolated really - an I think that came across - an that - also - his own views - growing up - what he was used to - what his mates did - what was acceptable - erm - people seem to want to quantify - I don't know - qual - whats the word - qualify - what - what they think - an they'll say - an often - you'll often hear that - er - Oh I know I've read it somewhere -

or somebody - a doctor or someones told me - that it - or - the doctors' wouldn't say that - they'd say it was bad - but - people want to then add - well that I - well its never hurt me I've been doing it for years - an - so - it - on the outside - an seeing him sit in the chair - an just chatting away - you wouldn't actually - you wouldn't immediately think - erm - you might say - he doesn't actually need hospital - traum - er - treatment - like trauma or accident and emergency or anything cropping up - but it could be that - er - there's more long term affects - erm - six years unemployed - is quite a long time - sometimes the unemployed become unemployable - because - an it could be - well obviously there's loads of factors affecting it - the area - er - if there isn't high employment - he - he seemed to really have erm high hopes in computers - but often - the case is that very youngsters - er - younger people - an they come in from - with er - higher education - go into computers an that the actual computer er - base for jobs is getting smaller - because computers by their nature - make for not some many er - y'know the sort of manpower needed - so - I'd say he - erm - I'd say he doesn't see - whether - if a pers - if you put something to a person whether they'd then - I don't know - he is really trying to not to sort of feel ill - an be sorry for himself - but he could possibly have - erm - well it didn't mention if he smoked or not - or I didn't hear - whether I was talking - when it came up - but er - a thing - er its - if you - a lot of things - er - stress and smoking and drinking an er - not being happy as in feeling fulfilled - it can lead to quite a few - y'know feeling bad erm - quite a few sort of cases of illneses - I mean - coronary heart disease - the statistics say - its -er - an its er quite a lot more in glasgow - I didn't hear where that area was either - but its very high - the cases are very high - an that - is the sort of thing that adds to - that life style can add to that sort of thing - I mean I'm summising - I mean - apparently he looked quite well - but it can all add to it -

R. Did you think that there was enough information there to enable you to make that decision?

S. No - not really - I didn't think so - erm - I didn't see actually - I saw him walking just in town - but it didn't really give you very much about his lifestyle - erm - I didn't

hear his wife talk at all - didn't see the other children - erm - no I don't really think there was - I mean - I think you'd possibly if you were there an you got to know him - whatever situation you were in - I mean - as a nurse - I mean he might be referred by the doctor to need psychiatric - perhaps just to talk like the community psychiatric nurse - I'm sure you'd get to know more - an could offer more advice by - y'know actual physical - con - well y;know - meeting - contact in that way - so I think it was quite limiting really - the - although you can pick up quite - y'know you can pick up quite a lot - I don't think there was enough - really if you were making serious decisions -

Post Decision Stimulated Recall

R. What made you think Billy was in his middle forties?

S erm - he'd got a family - so er - an - we were told there were three - an the baby was six months - an the others - were quite a gap between them - so I sort of was using that - the actual look of the chap - an that er - er - he was established as a turner - so erm - in engineering firms that would have been - to be established - you have to have - an apprenticeship - an get - so you wouldn't be thirty - I thought - I sort of - middle forties was a loose - sort of guess - thats it -

R. Why did you mention the prospect of traffic pollution?

S. I saw er - was very close - his house was actually very close to - er - overhead road - like a bridge - it was something - I mean they build those - they're either a dual carriageway or a motorway - they're not usually little side roads - so that must be heavy traffic I thought there - an it - er was on a council estate - an you'd got a little pan of the view of it - an it didn't look - in the coutryside sort of place - it didn't look rural to me - thats it -

R. You mentioned that he likes to keep his mind busy. Is that important to health do you think?

S. Yes I would say so - erm - just from my own judgement - erm - its all according - I suppose to what you've been used to - but I think - if you - if you don't then you

can become very bored - an I think - boredom - a - I don't know - if you - if - yeah if you become bored - I think it can be a bit soul destroying - in that sort of way - an I think - yeah - your mind an how you feel - affects you - an how you approach other things in life - dealing with things - so I would say that - an then - y'know keeping your mind busy - if - if thats what you're used to - I mean - thats - thats - y'know - I wouldn't sort of say - you must read this - an you mustn't do - its all according - y'know - er - I would say that yeah - it could definitely - it could be definitely detrimental if you - just sort of relaxed into - well not relaxed - thats the right word - just sort of didn't bother anymore - I think its the bothering - an er keeping busy in that way -

R. You mentioned his skin appearance, and that there might be a dietary connection. What did you mean by this?

S. erm - well - it just looked a little bit unclear - erm - an it just came to my mind - that er - er - possibly - erm - that - y'know - if - there's - there's evidence that er - if you are eating - little bit more greasy foods - an er - not fresh diet - not fruit - er there is evid - y'know - you could sort of suffer in that way - although - sometimes I mean it - you get a skin complexion with stress - it doesn't always just dietary - thats just what crossed my mind then -

R. What you think he looked tense?

S. he's - he was holding his hands - he erm - he appeared to be relaxed - but I think his shoulders looked quite set - an he didn't really move - have like body movement a lot - and he held his hands - sort of clasped - an then a little bit moving the thumbs - an that just seemed to me a little bit tense - possibly he's having an interview aswell (laughs) - feeling tense in that way - thats it -

R. You mentioned that he was home a lot. Would this be a problem in Billy's situation, or to health in general.

S. erm - it just - see - he - by the fact that he actually mentioned it - and he also mentioned that his wife was mentioning it - that I think it seemed perhaps there was a little bit of strain there - that he was around a lot - I mean - possibly just the

relationship they had - I mean up to -up to six years ago perhaps - er his wife was used to looking after the children on her own - at home - a lot in the day - or doing whatever - often - well - then if you're around you - erm - perhaps - that could be a little more strain - between erm - a couple - or the family - an he mentioned that the children asked also - about his situation - so obviously he - I think he was thinking about it anyway - I mean - it could cause a strain - being there - if your not - I don't - they didn't actually do things together - it appeared - it was separate things - being in the same house - but separately - an perhaps you - they got in each others way a little bit - that what I felt about that -

R. You mentioned the term motivation on several ocassions. Is motivation important to health?

S. erm - I think I used the term - probably - motivation to do things - an I was sort of thinking getting a job - if - you needed - y'know obviously - like there's a lot of - you feel you need a job - you need a job for money - an then to go out an actually if you're a part of the society - I think you could lose motivation very easily if you come across a lot of rejections - so yeah I think you do need motivation - er I think it possibly is part of health - er - if you haven't got it it could detract from your health a little bit - yeah - thats it -

R. In a similar vein you mentioned socialisation. Why is that important to health?

S. I think that erm - looking at Billy - from what we saw - he was mainly in the house - an that he said he spent a lot of time in the house - an the person he saw socially was his wife an children - an other people - possibly his family - I think it - yeah - I think it is important to see other people - an he obviously has been used to seeing other people - and er he's also mentioned that he used to go drinking erm - with his mates -so obviously its important to him - he mentioned it an now he feels thats - he's missing something - its been taken away - so I think - yeah - I think you need - I think socialisation is important - or feeling that you can go an er relax a little - an feel social with people - yeah - I think he - I definitely think - he - he mentioned it - he felt - that had gone - that had been taken away - somehow -

R. You mentioned that his wife made all the decisions. Might this pose problems do you think?

S. Yes - he explained that - got his Giro - then is was - cut up into all the various things they needed - which were vital things they needed to survive - an then perhaps if there was some left - he'd get a little share - an the way he explained it - although - I think he was both admiring his wife for coping - but also saying - er - he - he didn't like it - the fact that - this is important - that is important - that came first - then if there was any left - he would get some - I definitely think he felt that he was in the house - whether it was again by tradition an erm - thats the wife- thats his wifes domain - an she sorted things - an that was the law - as it was - an he was almost treated - well he didn't say that - but this was me sort of thinking like - the eldest child and given pocket money - I think sort of came across - a little bit - an he didn't have that many decisions to make - thats it -

R. You mentioned Billy drinking. Did you think he drank heavily?

S. erm - he's - he mentioned that he has before - he doesn't consder it heavy - I think he must be aware that it is heavy - because he also said professionals would say its heavy so he - didn't say an they don't know what they're talking about - but he just mentioned it - but he said - in their community or wherever they live it wasn't considered heavy - an you had at least 14 pints when you went out - the actual video showed a pub - he didn't actually say if it was his local or not - now - and from what he said he didn't really have a lot of money - left to drink a lot - I would say - that he's had to cut down - I think - that he - this is just me looking at everything - that he would still drink - because - I think that he would see it as a pleasure - an if he'd got money he would drink - whether heavily I'm not sure - whether the circumstances would stop him drinking heavily - but I don't think - I think if he suddenly had 20 pounds - he would run somewhere - I think - he wouldn't think it very bad if he went and drank - I don't think that he thinks its bad -

R. You mentioned that people tend to justify their health behaviours. Do you think people do this to serve their own interests?

S. Yeah - I - I - I think that people do - erm - I think they - they consider it - that - they'll sometimes - people will say - its their pleasure - or I don't know if its their only pleasure - or its how they relax - how - their means of relaxing - or socialising - and whats acceptable - and yeah I think they - I think they must be aware that it is damaging - some things are damaging - there's evidence of that - which they can't argue - but they do argue that - they've decided thats what they want to do - and - they're - although it can be damaging to health - it can - I think that they think it can - help their health - by relaxing them - or er they can be sociable - or that sort of side of it - I think they - I think they do like to justify it - it - that - I think that because they think there's more emphasis on it now - than ever - but I still think they do it -

Data:Phase 3

Subject 47

S. Bill - Bill is unemployed - he's erm lost the job - an erm - he's at home - and erm - and erm he - all what he does is erm - doing some exercises at home - but er - he does that er - its - its - its - his exercises is not regular - I mean his time interval - erm - Bill is a family man - erm - he's unemployed - for a long time - about six years - erm - I think erm - its affecting his health - y'know - despite his exercises an amount of his erm - I think he's erm - lost er - his self - esteem - I think he spends most of de time - er - in - in - indoors - just moves upstairs and downstairs - er - his wife - has er a baby y'know - because of that I don't think the wife too is working - and er - life is really making hard for - y'know - an he spends most of the time reading newspapers - an er - the way I see Bill he - he sits - isolates himself from the family - while the wife is er - attending to the baby - and er - y'know - Bill is desparately looking for a job - y'know - er - he - he always think about the family - an er - he - he - erm - Bill has been itching to get a job - for quite a long time - since erm - he lost his job - about six years ago - an he - he always think about getting a job - an er - I think thats - thats a bit of er - its - its - its more of a problem to him - an er - I think he wishes to take any job at all - that comes on his way now - er - yeah - he sees on play - er - playing for hours an hours indoors and er - I don't think that is going - is going to help Bill - erm - he needs to go out an socialise - as a family man he's - he's lost self-esteem - er - erm yeah - the - the - yeah - the - the job he lost has affected him in so many ways - er - it has affected er - his social behaviour - his outings his er - he used to play golf - but because of that he stopped playing the golf - and er - he can't afford to pay the cost involved - to buy equipment for this sports and games - an er - he seems isolated now - he's financially ill - and er cannot make ends meet now - er - I think he's depressed - mentally ill now - hmm - he likes - erm he used to drink - a lot - an er - the job - an he's being unemployed - er - has er - affected him in oh so many ways - he's really depressed y'know - and er - always think of the burden he's got -

the family - er - hes - hes er lost some - er - relationship - with friends - hmm - oh yeah -

R. please keep talking.

S. he's doing - he's doing - he's doing some - some correspondence course - so er - and er its based on home studies - erm yeah - he - hes - hes thinking that er - maybe in future that will - no I don't think Bill is right there (simulation ends).

R Would you agree with Billy then. Is he healthy?

S. No no - no no - not really - not at all - somebody who is er unemployed for six years - er - with a family - and er - owns a home - he's depressed - mentally ill - really - financially ill - and erm - has lost social interactions - social contact - because of er - he doesn't play games anymore - because he can't afford - and er - the family is a burden now to him - he's lost some friends - so erm - he - he at times - all he seems - to talk to himself - and er - he spends all the time indoors - which is not - you should go out an socialise - er but er - he's - he's isolate - he's not healthy at all - Bill - Bill isn't - er - an he's - desperate - looking for job - an he's been itching for quite a long time for job - an I think whatever comes in his way - any job at all - that come across Bill - Bill will take it - no matter what - an erm he's trying to - do some correspondence course - at home - with the aim that maybe in future - he - it can help - well thats a good idea - but still - he's very desperate - he's a desperate man - he's er - Bill is not healthy - cause er - if you - if erm - you read er the United Nations erm - definition for health - its not er - merely absence of diseases - er well - Bill - Bill physically you see Bill - is er - is a healthy man - hes not deformed in any way - he hasn't got any headache or something like that - but socially - emotionally - he's not sound - thats what the united nations definition say - its not merely the absence of disease - but erm - the holistic erm - of man - physical - like er - social - er - physical - mental - an all aspects that makes one unhealthy - so - erm - health - erm - as an individual pers - er perspection - I mean individual perspective - my position - Bill is ill - he's not a healthy man.

R. Did you think that there was sufficient information there to enable you to make that judgment?

S. erm - well - there was - but - is erm - bit of rush - so quick - an - I mean I could pick - was the matter - I just - tend to - -- thats why I hesitated some time to listen towards er Bill - thats y'know - about what I think - the - well - the information is - I thinking is about 70% - hmm -

Post Judgment Stimulated Recall

R. You mentioned early in the simulation that his exercise wasn't regular. Why did you think that ?

S. yeah - because erm - he says something like er - sometimes once a week - or once in two weeks - sometimes three months - an - which is - er - not - the - the appropriate way of doing exercise - I mean - if he wants to do exercise - he should be - here - continuous - er - so that er - I mean - it will aid the circulation of blood - and er - erm I mean - that is his - relieves him a bit from stress - but if he - I mean - leaves an interval - quite a long - er - erm - I mean - an interval - a tch - quite a long time - its erm - the - the more stress it puts on him - and er - I think - his circulation - the - erm - the metabolic rate - or something like that - performs malfunction - er - doesn't function properly - er - within the body - er - I think he should have done some regular exercises - er - because he stopped playing the golf - because of financial - reason - er - problem - the golf was er - the kind of exercise - which was - it was very good - and I think that he - did that every week - because erm - it as erm - from the employers - or something like that - but - he doesn't get that anymore - hmm - so its definitely affect - him -

R. You mentioned that he'd been unemployed for six years now, and it was affecting his health. Why did you think that?

S. yeah - because erm - If one loses a job today - one - thinks of erm - erm - how do I put it - one - aims of getting a job the next day - okay - erm - the following day - you still have the hope - but if it continues - for some time - then you see that - the situation is deteriorating - and - the er - amount of money - you've got er starts

running down - because you utilise - what you've got - without getting er any input in - hmm - so - one starts become depressed - hmm - an desperate - an this is whats happening to Bill now - hmm - because he thinks he's far away from job - and why can't he get job - hmm see - looking it as a whole - the family an all this - why can't he get a job to cater for the family - hmm - so that makes him sick - he thinks all the time - he spends all the time thinking about it -

R. What made you think that he had lost his self-esteem?

S. well - he works in the factory - plays - er - er an important part - working in a machine - an er - as a professional man - an now - erm - he's out of it - erm - he can't do that anymore - erm - he's lost all the social - reasons - er er - out of this - out of the the the the employment - so he feels low himself - he thinks er - an I not a human being - or am I not part of this society - now thats why I thought that -

R. You focused on the fact that he spent a lot of time indoors. Why would that be a problem?

S. erm - yeah - thats a very - big problem - because er - the more you stay indoors the more you lose social contact - erm - I mean - if you - if you want to sit down the whole day - in the - in the house - without going out - you tend to think about certain things you shouldn't - er - think about - er - but if - er - you go out - you meet friends - er - you see whats going on - cars moving an things like that - I mean - that relieves you a bit - this is happening to Bill - Bill is all the time indoors - playing games - reading newspapers - running up stiles - upstairs and downstairs - and er - he keeps thinking about the job all the time - so - I think he should go out a bit -

R. You also mentioned that you didn't think that his wife was working because she had a baby. Why do you think that this follows?

S. er - the - I could see that the baby was about - er - not even up to one year - six months - an er - most people don't prefer taking er - those infants like that - toddlers like that - to nannies - they should be - should be near them - so definitely the wife has to be at home - an then - look for the - cater for that er small infant - so thats what I think -

R. You mentioned that you thought he spent a lot of time reading newspapers. Would this pose problems?

S. erm - reading newspapers yeah - erm - newspapers contain a whole lot of information - good and bad - he might come across a situation like his own - an that might add more stress - isn't it - and sometimes too - can - well - relieve a bit from the - oh well I'm not the only person in such a situation - y'see - so its er both sides - and that - er well - you shouldn't read - it all the time - like that - I mean one has to devote some time for newspapers - but not to make it everything - like that - to newspapers all the time like that - is - is - is even boring - an how much can you - er - how many words can you read a day -

R. Why did you think he was isolating himself from his family?

S. I could see from the video - that er - while the wife was feeding the baby - Bill was sitting some way - reading the newspapers - if I were Bill I would go in - just to care for that little - that - that even relieves - erm from the stress - I would go - try to carry the baby - I - I can give him feed - the er - little - er - how can I put it - the little baby - like that - so I think he should participate - in those activities - er - so that er - he will feel - sometimes he will feel at ease-

R. What made you think that he always thought of his family?

S. cause erm - he owns a home - hmm - probably is paying mortgage - and er - the children needs clothing - and this comes to worry the wife - the wife - the wife is - is not working because of the baby - so where can they get clothing to the children - if er - lets say its er - birthday to one of the children - how are they going to celebrate it - y'see - this makes life different in his family - and is all a problem - to him - because er - he has to - dad is not - er doing this because of that - erm the children go to school - they meet friends an they talk about their family - about home their parents - oh it was my birthday yesterday an this is what happened - yeah - but Bills children are not getting that - because he's unemployed -

R. What made you think that Billy was actively seeking employment ?

S. hmm - yes he was - yeah he - yeah he was itching to get a job - yeah he mentioned that he has been unemployed for six years - and er - so - he can't get any job - an if he get a job today he would take it - hence he was using his spare time - to do that correspondence course - so that he gets something to come - out of it - actually he is desperately looking for - a job - because he is financially weak - and er - even his - his own outings - he used to drink - he used to drink - er - he has caught his limit now - hmm - because he can;t afford any more - its all affecting him -

R. why would playing indoors a lot be a particular problem?

S. yeah - it er - erm - he - he play indoors an he plays alone - an thats not - socialising - er - so erm - losing contact an erm - he doesn't hear from people - other people - probably if he had gone out - to play outside aswell - I mean - he might have got some- I mean - advice from friends - and other people aswell - and the - the - the time he spends at home playing - he could have - he could have used the time to go to the job centre - to find something else - for - that could have even helped - even he could - even he meet a friend - and the friend can mention that a job is going somewhere - er - I think that might help - rather than to be sitting down playing the games all the time - er what - can that - yeah - one has to play - you can play a game - for some time - but then - you've got to think - that what is it going to give to me - and then - so if you go out to look for - y'know -

R. Why is socialising so important?

S. er - if you socialise - you don't get more stress - if you are stressed - and you do socialise - erm - its - it -relieves you a bit - from I mean stress - because er you - it decreases your thinking ability - er - yeah - you don't think too much - because you are with people - and er - some trouble looks less in the pub - theres music - and live band - and film or something like that - so - it - keeps you mind afresh - rather than to be sitting down - then - to be thinking all the time about - hmm - so - socialising is a very important role in ones life - and er - Bill should have - er - I mean - er - adopt to that kind of system - an - the more you socialise - the more you hear from people - the more you hear a lot from other people - to know what to do - I mean

sometimes problems are solved - when you meet other people - and then - you can put your problem before other people - some people an - I mean - take the advice from them - sit down - an then er - analyze - and assert - the - assess the advice - an - I mean - you can work yourself through - I think Bill should have done that -

R. How has Billy's unemployment affected his social behaviour?

S. erm - because -er - hes not receiving money anymore to pay for outings - and er - his er sporting activities suffers because of the financial er - aspect - and er - he feels - because hes lost self esteem - he feels odd to go to other people - he feels so - hmm look at my state - erm - do I fit - to be another - they 've got - they are jobs - they are well off now - they - they - they can look after their family - I'm not one of them - I don't fit in that kind of- erm - psychological - hmm - er - he thinks like that - so he feels that he doesn't fit into that kind of group - yeah -

R. Why did you think he actually gave up golf?

S. hmm - he mentioned that he couldn't afford to pay - er - for the golf -and er - to buy the equipment - and all this - its all to do with financial problems - and er - erm - an one thing I think - is erm - if - he feel depressed an erm - he couldn't cope - with the sporting activities - because of this - and he doesn't even feel like going to - yeah - going to - I mean do that kind of sporting activities - and er - really he can't cope - and moreover - he stopped for some time - and its not easy to begin with again - because he felt weak himself - because he - he been sitting down - all the time at home - to catch up - would be - er another different thing - also to maybe to get er - to get er a new equipment - or something to start with - then he - he can't afford -

R. What did you mean by that statement that he's financially ill?

S. erm - Financially ill - yeah - er - means financial problems - he hasn't got money - and er - even to buy this much - involves money - erm - to even buy the feed for the that - infant - needs money - so he keeps thinking about it - an that makes him ill -

R. why did you actually think he was mentally ill ?

S. hmm - if erm - one started thinking all the time - er - because of financial problems - or er - loss of job - marriage - broken marriages an all that kind of things -

erm - things you used to do before - an now you can't do it - I mean - you become depressed - and thats mental illness - mentally - its not physical - but its mental illness - in the brain - because the brain is - malfunctioning - hmm - yeah - an er - the - its - its receiving er - loads of er - thinking - which is er - so that makes him mentally ill

R. Why did you think he used to drink a lot at work?

S. er- no - I said er - he used to drink - to drink when he was working - because he mentioned that he used to go to pubs - hmm - to drink - because he has lost the job - he can't get money anymore to buy the drink - so he drinks not a lot -

R. Why is losing contact with his friends significant?

S. hmm - if erm - he he - he feels - how do I put it - he feels low to go to the friends now - he feels - erm - the friends are higher than his position - because they are still having their job and er - they are well off - they are well to do - and he is not - and he has lost his self esteem - so - he doesn't feel fit in that group - yeah -

R. Did you think home studies were a good idea for Billy?

S. No - at - looking at Bills state - he should have taken a part time job somewhere - for lectures - to receive lectures - and er - no matter the subject - counselling comes in - every subject - which could have helped maybe - an he could have found more from other mates - an the tutors as well - so I think - I mean he can do the home studies in his spare time - hmm - an then - the rest of the time at the college or the adult institution or something like that or something - thats what I felt - (end).

Appendix 7

Watson - Glaser Critical Thinking Appraisal

Group 293

Combined Raw Scores and Demographic Data

Subject	Age	Gender	Ethnicity	E/Quals	RSU	RST
1.	37	F	W	DC(1)53	65	48
2.	32	F	W	5 O /GCE	51	38
3.	21	F	W	5 O/GCE	48	27
4.	20	F	M	5 O/GCE	49	34
5.	19	F	I	5 O/GCE	35	35
6.	35	F	W	DC(3)60	61	61
7.	32	F	W	5 O/GCE	68	54
8.	26	F	W	DC(1)51	44	35
9.	23	M	I	5 O/GCE	38	30
10.	28	M	B-A	5 O/GCE	46	40
11.	21	F	W	5 O/GCE	49	32
12.	18	F	W	5 O/GCE	49	33
13.	19	F	W	5 O/GCE	51	34
14.	21	F	W	5 O/GCE	53	46
15.	29	F	W	3 O + 1A	53	31
16.	23	F	W	DC(2)52	63	60
17.	23	F	W	5 O/GCE	49	42
18.	22	F	W	5 O/GCE	49	47
19.	28	F	W	5 O/GCE	59	53
20.	18	F	W	5 O/GCE	46	41

Subject	Age	Gender	Ethnicity	E/Quals	RSU	RST
21.	21	F	W	DC(1)52	47	31
22.	35	F	W	5 O/GCE	54	44
23.	20	F	W	5 O/GCE	50	50
24.	21	F	C	3 O+ 1A	48	48
25.	18	F	W	5 O/GCE	44	32
26.	19	F	W	BTEC	49	49
27	29	F	W	5 O/GCE	43	27
28.	20	M	I	5 O/GCE	47	29
29.	24	F	I	DC(2)54	50	40
30.	40	F	W	3 O + 1A	58	57
31.	31	F	W	5 O/GCE	53	52
32.	39	F	W	DC(1)53	58	42
33.	33	F	W	5 O/GCE	60	36
34.	22	F	W	5 O/GCE	58	49
35.	28	F	W	5 O/GCE	69	55
36.	25	F	W	5 O/GCE	50	39
37.	23	F	W	5 O/GCE	61	51
38.	20	F	W	5 O/GCE	53	51
39.	28	F	W	5 O/GCE	56	33
40.	19	F	W	DC(1)57	58	47
41.	24	F	M	DC(2)64	36	26
42.	37	F	W	5 O/GCE	54	46
43.	21	F	W	5 O/GCE	44	22
44.	19	F	W	5 O/GCE	57	31
45.	20	F	W	5 O/GCE	53	33

Subject	Age	Gender	Ethnicity	E/Quals	RSU	RST
46.	32	M	W	DC(1)58	47	21
47.	35	M	B-A	5 O/GCE	34	18
48.	25	M	B-C	DC(1)59	56	52
49.	23	F	W	5 O/GCE	46	36
50.	19	F	W	5 O/GCE	44	27
51.	36	F	W	Access 46	42	
52.	28	F	W	5 O/GCE	52	45
53.	31	F	W	DC(2)53	50	47
54.	20	F	W	5 O/GCE	68	63
55.	19	F	W	DC(2)53	62	50
56.	23	F	W	5 O/GCE	52	33
57.	21	F	W	5 O/GCE	54	26

Appendix 8

Simulation Narrative (Billy)

I've never felt my health being affected through being unemployed -

because I' ve - occasionally I do some exercises - I go up the stairs - an whenever it takes my fancy - an I do a lot of exercises - but then - I - as - being only human y'know - its few an far between - but I do enough - to make me feel good for a - when I've got an interest - I'll maybe do it two or three days - in succession - then it'll go out of my head - that I can't - I can't be bothered doing it again - maybe for another week - two weeks - three weeks - a month maybe even three months - y'know it all depends just the way I feel - The last time I had a holiday was in 1981 - an it could be another seven years before I get one the way things are y'know -

Commentator - Billy Burns lives with his family in South Queensferry - he an his wife Francis have three children - two are older school children - and the youngest is a six month old baby - Billy owns his own home - but has been unemployed for the last six years - he was a skilled machine turner -

B - When I - when I get up which is usually close on to midday - because my wife - she prefers me to be out of the road in the morning - to get her chores done - get the kids out to school - then - I get up - have something to eat - read my morning paper y'know - I always get a good quality paper so as it'll last me all day y'know - then after that I'll put on a game on the computer - or a game of chess or a game of scrabble - which I play for hours on end - y'know fills up a lot of time - then that goes on - that goes on - maybe until - well after the kids come home from school - then after that - its er - tea - I go out the back - play football with my boy for maybe about an hour - back - back to the chess again at night - an - most days are the same - Francis always - er - is sort of fully - fully in charge y'know - as far as housework - an looking after the baby's concerned - an she prefers it that way - because she can get on with her work without bothering about me - an - I just - I can sit just playing the computer all day - an - or reading my paper - its not - its not as if I'm - arguing -

or y'know - doing a lot of er discussing with each other - because shes got - practically a full-time job - with the baby - an therefore shes - y'know shes - shes not got time to bother about me - so shes quite happy about me just sitting - sitting about - goes to the shops - comes back - she always takes her baby with her - then she goes about her business - gets the meals ready for the kids - coming in from school - I always look everyday - I always look in the paper for a job - but they never - never seem to crop up - it never erm - undermines my confidence - because I realise its not my fault - if I - if I had er a job tomorrow - I would take it - it does make it hardest when er - the kids mention - mention it - that makes it - that makes it hard - an - mostly the fact that its hard to explain it - y'know - about the way I feel about it - Its one thing trying to explain it - but - its not only explaining the situation - its explaining my attitude towards that situation - y'know - it make it even more difficult - I - I found - er - at first- when I first became unemployed - I thought I would have got a job within days - y'know - let alone weeks - I thought it'd only take days to get a - an I tried everywhere - then thats when I realised how hard it was - I went to places that no longer existed - an er - I got a right shock then - but after that - I just came to accept it - there's - there's not really much I came do about it - I never get fed up because er - chess is one of these games - that y'know - that you just don't get fed up with - you play it for hours an hours - an every game - every games different - every moves different - you don't have to be good at it - y'know - just enjoy it y'know - an its very intriguing - things that were important to me in the past when I was working - y'know if something needed painted - I - I'd get up and paint it - y'know - if er - wallpaper - anything like that - I'd do it - just as a matter of course - where now - well for one thing I can't afford the materials - but - also for a small thing - I'd put it off y'know - I just - I've not got the motivation I used to have- I don't play golf anymore - I gave my clubs away to my young brother - because er - I couldn't afford the social side of goin to the golf - because its a thing you do - is - after the golf you always go into the clubhouse afterwards for a drink - so I had to give up golf - for that reason y'know - cause I couldn't afford to - to keep up that way y'know - with

the golf situation - although the golf is cheaper being on er - when you're unemployed - but it costs a lot more after the golfs finished - so I had to give that up - well I get my Giro once a fortnight - an er - my wife cashes it along at the post office - then she sits down an she works out how much needs for to pay the bills - which of the bills were found due for that fortnight - she'll budget for that - she'll make out a list for a - the meals we're going to use- going to - have to buy for the next fortnight - then er - she goes into town - buys - buys er - all the teas we want from er - the freezer - the freezer centre - enough to last us for these two weeks - and whatever - whatevers left y'know she'll leave me something extra to go out for a drink y'know - an depending how long other people stay - I'll usually stay as well y'know because thats my day out y'know - an that - that session could be anything between about 8 pints - an 14 pints y'know - but to - it sounds a great - by - to people that er - drink fairly regular - its not really a lot y'know - maybe a doctor wouldn't say so - but er - for people that drink regularly its not really a great deal - not on a fortnightly basis - but maybe so for people doing it - if they were doing it everyday - that eats a lot into the meagre budget I've got at the moment - but er - the friends because I've known them so long - they've been prepared to pay that little extra y'know just to keep the company going an - I always met them - prior to being unemployed - it was al - it was a regular occurance - I don't see them as much as I used to - but we've all - socialised with each other for so long - we just feel that there's got to be some kind of continuity - I could never get another job as a turner - in the forseeable future - I - an er - as a manual - manual worker y'know with er - in the computer side that would be my only chance I think - I'm doing er - a correspondence course at the present moment from Telford College - its called er - flexi-study - an you study at home - its just another - another avenue y'know for an interest - an hopefully - somewhere along the line it could lead to - to employment in the future. (end)

Appendix 9

MSc Advanced Clinical Practice

Grading Scale - Level 4

Exceptional Standard

A grade category: The student demonstrates an excellent capacity to express views and conclusions based upon sound argument, counterargument, judgmental or contextual criteria and genuine evidence in an articulate and concise manner. The original views of the student and those inherent within the literature are clearly differentiated and inferences are valid. There is evidence of a comprehensive overview of an area of professional concern, which includes a comparative and critical review of a variety of theories, concepts, knowledge claims and alternative frames of reference. There is evidence of an ability to successfully synthesise theoretical issues into practice and evaluate the possible implications using appropriate professional or clinical criteria.
Overall presentation: The assignment has a lucid structure, a clear statement of intent, that is adhered to, and a concluding section. The introduction and rationale for selection of topic is clear and precise. The standard of writing, sentence construction, spelling and logical development of argument is excellent. The Harvard System of referencing is used accurately throughout in text and reference list. Appendices are clearly labelled, germane to the work and are explicitly referenced in the main body of the text. Empirical evidence when used is accurate, clearly presented and relevant to the assignment. Worthy of publication.

Very Good Standard

B grade category: High level of analysis, synthesis and evaluation. The student's views and arguments are coherent, realistic, and well founded upon genuine evidence. The work represents a clear overview and interpretation of the issues in question as applied to a professional context. Concepts, theories, positions and knowledge claims are considered critically throughout and inferences are generally valid. Alternative theories and counterarguments are generated although the criteria for evaluation may not be clear or consistently substantiated. The implications for professional practice are critically discussed and appropriately applied.
Overall presentation: The assignment has a lucid structure, a clear statement of intent which is adhered to, and a concluding section. The introduction and rationale for selection of topic is clear and precise. A high standard of writing, sentence construction, spelling and logical development of argument is evident. The Harvard System of referencing is used accurately throughout in text and list. Appendices are clearly labelled, germane to the work and are explicitly referenced in the main body of the text. Empirical evidence when used is accurate, clearly presented and relevant to the assignment.

Good Standard

C grade category: Higher level of analysis demonstrated by the identification of a variety of dimensions and concepts pertinent to the subject area or issue at hand. Interrelationships are alluded to but not rigorously or systematically described, justified or substantiated. There is evidence of appropriate interpretation, however, some inferences are questionable. Any potential for bias or counterargument is raised but not expanded upon or thoughtfully considered throughout.
Overall presentation: The assignment does not have an entirely lucid structure, a clear statement of intent that is adhered to, or a concluding section. Introduction and rationale for selection of topic is clear, but could be more precise. There is a satisfactory standard of writing, sentence construction, and spelling although some errors are evident and a logical development of argument is at times unclear. The Harvard System of referencing is used with some errors throughout. Empirical evidence when used is accurate, clearly presented and relevant to the assignment.

Satisfactory Standard

D grade category: There is evidence of a degree of interpretation showing knowledge and understanding of the subject area. The level of analysis is acceptable, in that, appropriate dimensions and concepts are identified and discussed but not necessarily interrelated and synthesised to practice. Alternative perspectives are not consistently identified or pursued with any depth or rigour. Alternatives raised are essentially distorted or ignored for a one-sided perspective and not integrated into the terminal conclusions. The validity of inferences is questionable. Potential limitations of the work are not explored fully. Implications for professional practice are considered but essentially from a one-sided, superficial perspective, which could be more rigorously explored and substantiated.

Overall presentation: The assignment does not have an entirely lucid structure, a clear statement of intent that is adhered to or a concluding section. The introduction and rationale are reasonably clear but lacks precision. A generally acceptable standard of writing and sentence construction although some errors in syntax, grammar and spelling exist. Arguments are simplistic and not systematically thought out. Harvard system used with numerous errors.

Unsatisfactory Standard - Resubmission Allowed

E grade category: A purely descriptive account demonstrating only minimal interpretation.
There is some limited discussion of the dimensions and conceptual issues surrounding the topic and no evidence of analysis, synthesis or evaluation.
The work shows some insight into the subject area but is limited to a simplistic one-sided perspective. No counterarguments or alternative frames of reference are

generated or considered. Implications for professional practice are considered in a superficial or inappropriate manner.
Overall presentation: Introduction and rationale lack direction, purpose and clarity. Writing style is at times incoherent and presentation is poor with many errors in syntax, grammar and spelling. Harvard style of referencing is used but with numerous errors. Barely acceptable presentation.

Unsatisfactory Standard - Retake of Module Required

F grade category: Fails to meet the criteria for E. Unacceptable

FO: Non-submission of assignment.

This scale has been founded upon the work of the following individuals:

Professor C. Clifford (University of Birmingham);

Jo Allen (1996) Design for Learning 2nd Ed, University of Wolverhampton.

W. M. Daly (University of Wolverhampton).

Mapping of Common Grade Point Scale to Four Point Scale

Pass with Distinction	- (PD)	approx. 70% of passes at A grade, i.e. for 4 modules + dissertation
Pass	- (P)	- D – B range
Recoverable Fail	- (E)	-E
Fail which requires the module to be taken again	- (F)	-F1- F0.